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November 1, 1976 - April 30, 1977

APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROBLEMS

NASA Grant NGL-25-001-054

Submitted To

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Office of University Affairs
Headquarters
Washington, D. C.

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November 1, 1976 - April 30, 1977

APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROBLEMS

I. INTRODUCTION

Although a tremendous proliferation of research in the area of space imagery applications has occurred since 1972, the full potential of the space program has not as yet been realized. The impetus provided by the Gemini and Apollo missions led to the research and development explosion created by the LANDSAT and SKYLAB missions; indeed, the amount of literature being generated every month in technical journals is staggering. Unfortunately, the vast potential user community has not reaped the benefits of this storehouse of information - a vacuum has been created between scientific achievement and operational utilization of the data. The problem of technology transfer has many ramifications, not the least of which is user education in the concepts of sensor resolution, data formats available, and feasible uses. Other facets of the problem include data acquisition and transformation to products acceptable to the users. Optimized institutionalization of data management, product transfer, and education of the user community are also of major concern. With respect to the latter, various structures have been suggested, and NASA has implemented technology transfer through funding of ASTV projects and Remote Sensing Applications Programs.

The problems mentioned above assume even greater significance in view of the plans for the launch of LANDSAT 3, and the LANDSAT FOLLOW-ON package.

Mississippi State University was awarded a grant by NASA to effect remote sensing technology transfer in Mississippi and the Mid-South region, and to demonstrate the operational uses of remote sensing in providing the basic data and information necessary to solve problems of State and regional importance.

In order to accomplish technology transfer with maximum impact on user groups, an applications program must be sufficiently flexible to provide services and products to a wide variety of consumers. Although the major emphasis of transfer programs today is on computer-assisted, classfication/pattern recognition analysis of LANDSAT CCT's, a flexible program which incorporates some elements and products of conventional interpretive skills will help to insure reasonable payoff from all remote sensing products evolved from the NASA program. Evidence that this is a viable approach is contained in Section A, and Appendix 1; State officials have accepted the results of one of the NASA-MSU application projects and successfully defended decisions based on these results to both the public and legislators.

Members of the University community at Mississippi State are participating in activities which will enhance communications between the scientific community engaged in remote sensing research and development, and the user community, These activities are an integral part of the stated objective of the program which is to assist the State of Mississippi to recognize and solve environmental, resource planning, and socio-economic problems.

In order to achieve this purpose, the participants in this program and collaborating departments are interacting with State and federal

agencies, counties, and citizen groups in the following ways:

1. Identifying and analyzing State and local problems, real needs of major importance, which remote sensing techniques of demonstrated feasibility can help to solve.
2. Assisting potential users to learn how to better use remote sensing where it is appropriate to the solution of specified problems.
3. Conducting remote sensing applications programs to bring remote sensing technology to bear upon the solution of selected high priority problems.
4. Identifying additional research needs to which remote sensing technology may be applied and establishing priorities for meeting these needs.
5. Stimulating, guiding, and aiding the faculty and students at Mississippi State University, and others in the State of Mississippi, to utilize information from the NASA Earth Resources Satellites and the Aircraft program in research and public service activities. This program is augmented by cooperation from the EROS Users Assistance Center, National Space Technology Laboratories at Bay St. Louis, MS, and the George C. Marshall Space Flight Center at Huntsville, AL.
6. Provide a center of expertise and an operational laboratory for short-course training of users, and provide assistance to departments and agencies in utilizing appropriate remote sensing technology in solving their problems, and making certain specialized equipment available to users.

Program participants are recruited from various departments of both the University and the Agricultural and Forestry Experiment Station, and expertise is currently available in the areas of Agronomy, Wildlife and Fisheries, Forestry, Geology and Geography, Landscape Architecture, and Computer Science. In a ition, input to the program is being obtained from State and Federal agencies such as the Forestry Commission, the Parks Commission, the Geological Surveys of both Mississippi and Alabama, the Research and Development Center, the Governor's Office of Science and Technology, and the U.S. Forest Service.

W. Frank Miller, Associate Professor of Forestry, is serving as Program Coordinator. Other key personnel in the program include:

Dr. Bradley D. Carter, Associate Professor of Computer Science;

Dr. David E. Pettry, Professor of Soil Science;

Dr. Gary K. Higgs, Assistant Professor of Geology & Geography

II. PROJECT PROGRESS REPORTS

A. The Natchez State Park - Adams County, MS

This project, which combined remote sensing inputs, data management and model development has proven to be the most successful technology transfer attempted by the Applications Program. The objective of the project was to assist the Mississippi Park Commission in determining the best location for a new state park in western Adams County, Mississippi, and, in a second phase, to provide the data base necessary for preparation of the master plan for park facilities. Based on the preliminary site location data provided by the Applications Program, Mr. Bill Barnett, Executive Director of the Mississippi Park Commission, in announcing the site selection to an audience

which included members of the Adams County area legislative delegation (and irate landowners), stated that, "More effort was put into the site selection of this park than any we have seen." After briefly describing the Applications Program effort and indicating that 11 sites had been considered, he continued "Like a giant funnel, it all narrowed down to this site with no major questions at all. This is the only logical location in the study area - it really is." (Appendix 1).

Mr. Thomas Wetzel, Director of Planning and Engineering for the Parks Commission, in a letter to the Program Coordinator (Appendix 2), reported that the information gathered by the Program "has been used in making almost all planning decisions ... ." In addition, he estimated that the use of the technique, " ... as applied to the task of rationally locating a state park has saved the State of Mississippi approximately $40,000 to $50,000, and one and one-half years in accomplishing the location phase of the project and approximately $15,000 to $20,000 and six months in providing indepth site data."

In addition to providing the data needed by the Parks Commission for decision-making on the Natchez site, and providing a system for use in future planning problems, the results of the study have had a much wider impact. The Advanced Landscape Design course offered by the Department of Landscape Architecture utilizes the data management system and the data for the Adams County area; A group of students undertook a study in cooperation with the Mississippi Agricultural and Industrial

Board which investigated the possibility of integrating industry, recreation, and a planned unit development (Appendix 3).

Additional benefits have accrued from the utilization of the technique in other types of planning and development activities. Project E, Remote Sensing Applications in Land Use Planning, employs the same software package and remote sensing techniques, and, more recently, the application of the technique to optimization of logging operations is being explored. A paper which merely mentioned the technique was presented at the Winter Meeting of the American Society of Agricultural Engineers, and generated a great deal of interest in the potentials of procedure (Appendix 4).

Plans

The software package (CALUP) is being refined and standardized in a format which will be suitable for the IBM computers of the Mississippi Central Data Processing Authority. The package will then be transferred to the Mississippi Parks Commission for use in future planning projects.

B. Bark Beetle Project - Copiah Co., MS

Objective

The objective of the study is to provide information to the Mississippi Forestry Commission (MFC) which will allow the organization to identify and map high-risk forest stands; that is, those stands which have characteristics that cause them to have a high probability of attack by the Southern pine beetle.

Accomplishments

This project has remained inactive pending completion of the Sixteenth Section project.

Current Status

Inactive

Plans

Digitized contour data from NCIC tapes will be used in conjunction with the LANDSAT digital tape analyses to attempt delineation of high-risk stands. This classification will be verified by comparison with existing stand locations as obtained from manual interpretation of low-level color infrared imagery, and from ground truth.

C. Resource Inventory - The Homochitto National Forest

Objective

The objective of this project is to demonstrate the utility of various remote sensing products in supplying information for different levels or intensities of planning in natural resource management: specifically, to supply information necessary to evaluate wildlife and forest habitat quality and recreational potentials.

Accomplishments

This project remained essentially inactive awaiting the testing of the software package from MSFC and digitized contour tapes.

Current Status

This project is inactive.

Plans

Terrain information will be utilized in conjunction with signature analysis of digital LANDSAT data in order to extract the maximum amount of information concerning productive potentials for the various forest resources.

D. Forest Resource Inventory of Sixteenth-Section Lands - Copiah County

Objective

The objective of this project is to determine the most efficient procedure for updating inventories of sixteenth section lands, and to provide a basis for more intensive management of the State's forest resources.

Accomplishments

The "HINDU" software package was utilized to run an unsupervised classification as the preliminary step. It was possible to identify forested lands, agricultural fields and pastures, and "other" land use. However, it was not possible to separate pine stands from hardwood stands by increasing the number of classes of grey levels.

The next step was an unsupervised/supervised classification again using the HINDU package. In this procedure, HINDU was utilized to separate all forested areas from all other categories, and then training samples were located on 1:120,000 color infrared imagery and utilized to discriminate pine from hardwood stands. An accuracy of 88.5% was achieved.

A third procedure was utilized with the CCTs. Again using the CIR positive transparencies for training sample

selection, a supervised classification was performed. Five land cover classes were identified; pine, hardwood, pastures, winter wheat, and water.

In the second phase of the study, microdensitiometer measurement of both high and low altitude CIR positive transparencies were analyzed. In the initial printout, a cell-by-cell product was obtained. This product proved to be unacceptable due to the large number of data points per unit area (± 3200/ac). A second method averaged the grey levels of an N x N block of data points, and this mean was utilized as the resulting pixil density. This was unacceptable because the averaging created new grey levels not found initially in the N x N blocks. A variation of the second procedure was tested. In this case, the grey levels of N x N block were listed, and the model density was selected as the resulting data point density.

Current Status

Data are in the final stages of reduction, and a complete report is in the final stages of preparation. Work continues on refinement of threshold values for different land cover categories.

Plans

Adoption of the technique by the Land Commissioner's Office is being pursued. CCTs of coverage from a late summer, 1976, overpass will be obtained and correlated with a recent low altitude CIR coverage in order to refine land cover categories and provide the updated information to the Mississippi

Forestry Commission. There is a great deal of continuing interest and controversy concerning the sixteenth section lands in Mississippi (Appendix 5).

E. Remote Sensing Applications in Land Use Planning

The rationale for the project is the rapidly increasing public awareness of the potential impacts of the Tennessee-Tombigbee Waterway project in northeastern Mississippi. This awareness has stimulated a concern for comprehensive and rational land use planning decisions (Appendix 6). Two state agencies requested assistance with a pilot project to illustrate the time and cost effectiveness, and utility of data obtained by remote sensing as a basis for decision-making. The Golden Triangle Planning and Development District and the Mississippi Research and Development Center are active cooperators on this project.

Objective

The objective of this project is to demonstrate the utility of a data management system based largely on remotely sensed data in the land use planning process.

Accomplishments

During the course of two meetings between representatives of the Golden Triangle Planning and Development District, the Research and Development Center, and the Applications Program, a final list of physical, biological, and cultural variables was developed (Appendix 7). In addition, suitability models were developed for the following land uses: Commercial and Institutional; Industrial; Residential; Sanitary Land Fills; Passive Recreation; Active Recreation; and Wildlife Habitat (Appendix 8).

In order to evaluate the rationality of the decisions made in assigning values to the suitability model variables and subvariables, a penalty point system was developed by Dr. Carter. This technique allows normalization of the percentages contributed by each subvariable to the total suitability. By comparison of these values, the amount of "penalty" can be assessed by moving from one condition to another within a variable.

For any suitability model, weights are assigned to each variable class on a proportional basis. Using Passive Recreation as an example, the interdisciplinary team felt that the nature of the forest cover was the most important of the variables which indicated attractiveness and vulnerability of a land area for use a recreational site. A weight of 1 was arbitrarily assigned. The variables of surface water and existing land use were felt to be only 3/4 as important, and proximity to the Waterway and soil characteristics were felt to be only 1/2 as important at the forest cover. Using a blow-up factor for ease of computation, weighted values of 12, 9 and 6 were assigned. The percentage weight was computed by dividing each variable weight by the total points. In this manner it was determined that Variable 1 contributed 28.6% of the total model suitability; Variables 2 and 3 contributed 21.4% each; and Variables 4 and 5 contributed 14.3% each (Appendix 8).

Each subvariable was rated on a 1 (low) to 9 (high) desirability for the particular use. For example, within the

within the Existing Land Use variable, forest land received a high rating (9), low-density residential areas received a low rating (1), and active recreation areas received an average rating (5). All other land use classes were rejected. The following procedure is used to assess penalty points:

Existing Land Use

forest land 1.0 - 9/9 x 21.4% = 0 points

low-density residential 1.0 - 1/9 x 21.4% = 19.0 points

active recreation areas 1.0 - 5/9 x 21.4% = 9.4 points

Therefore, if a cell contained low-density residential development, it would be assessed twice the penalty of a cell containing an active recreation development. This then raises the question, is the presence of a residential area twice as "bad" as the presence of an active recreational area? Comparisons can also be made between major variables and subvariables.

Current Status

Due to a change in the desired cell size suggested by the R & D Center, variable coding is still in progress.

Plans

Variable digitization will become the number one priority upon completion of the sixteenth section and the strip mine projects.

Results will be transmitted to both the R & D Center, and to the Golden Triangle Planning and Development District in the form of thematic maps illustrating the most desirable locations for each land use class.

F. Applications of LANDSAT Data to Strip Mine Inventory and Reclamation Progress

Objective

The objective of this project is to provide the Geological Survey of Alabama with the necessary software and interpretive technique for monitoring strip mine occurrence and reclamation activities on a periodic basis. This information will also be made available to the Mississippi Geological, Economic, and Topographic Survey, the State agency which is responsible for administering the recently passed strip mining law in Mississippi.

Accomplishments

A study area located in the heart of the Black Warrior Coal Basin has been selected for study, and an appropriate cloud-free CCT has been obtained from Sioux Falls. The area encompasses four, 7½ min. U.S.G.S. quadrangle sheets; Goodsprings, Cordoba, Jasper, and Parrish. An unsupervised classification was performed, and personnel from the Alabama Geological Survey and the Applications Program selected tentative training sites. The Survey is providing both high and low altitude CIR positive transparencies for use in sample selection. The sites selected have been transferred from the low altitude imagery to the four quad sheets by means of a vertical sketchmaster.

A representative of the State Geologist of Mississippi contacted the Program Coordinator concerning the possibility of cooperation on this project. A recently passed strip mining bill enpowers the Mississippi Geological, Economic, and

Topographic Survey to administer the provisions of the bill. (Appendix 9). A meeting between representatives of the State Soil and Water Conservation Commissioners, the Survey, and the Applications Program has been tentatively scheduled for May.

Plans

Following the supervised classification, personnel from both agencies will conduct intensive field investigations to verify signature analysis. A CCT of later date will then be analyzed to determine the feasibility of rating reclamation efforts.

G. Remote Sensing Applications for Industrial Siting on the Tennessee-Tombigbee Waterway

The Mississippi Research and Development Center is committed making a "detailed inventory of developable, industrial sites along the proposed Tennessee-Tombigbee Waterway in Mississippi." (Appendix 10). Because there was considerable overlap in their proposal to the Appalachian Regional Commission, and the work proposed by the Applications Project, the R & D Center requested assistance from the Program. The R & D Center has agreed to input assistance in the form of identification and construction of suitability models, collection and formatting of socio-economic data, and evaluation of alternative development plans (Appendix 10).

Objective

The objectives of this project are: (a) to inventory the lands within a corridor 10 miles in width centered on the proposed route of the Tennessee-Tombigbee Waterway; (b) to

identify sites suitable for industrial development; (c) to rate the sites on the basis of suitability for major types of industrial development.

Accomplishments

The process of evaluation and prioritization of potential industrial sites along the River has been divided into two basic tasks:

1. accumulation of information relating to socio-economic factors, and
2. accumulation of information related to physical and biological factors.

The Mississippi R & D Center is undertaking the evaluation of the socio-economic factors, and the Department of Geology and Geography is engaged in the analysis and evaluation of the environmental factors pertaining to the suitability of industrial sites. The Departmental task has been divided into 12 specific tasks as follows:

Task 0. Locate and plot site

Task 1. Determine slope and slope length

Task 2. Determine soil bearing capacity and water capacity

Task 3. Present land cover and use

Task 4. Local relief

Task 5. Subsurface features and geology

Task 6. Erosion vulnerability

Task 7. Danger of air and water pollution

Task 8. Destruction of irreplacable resources

Task 9. Other potential sites in area

Task 10. Evaluate site for industry and type of industry

Task 11. Final report

Progress to date is summarized in Figure 1. All sites specified by the R & D Center have been plotted, and the sites were inspected (Task 0) on the ground. The sites have been plotted on computer output derived from a supervised classification of LANDSAT MSS data, and the output has been ground checked during the site inspection phase.

Slope inclination length data have been obtained for seven sites (Task 1). Soil bearing capacity studies (Task 2) have been completed for three sites, and are in progress for an additional three. Utilizing the CCT printouts, low and high altitude imagery, and ground truth, the present land cover has been determined for four sites. Local relief calculations (Task 4) are complete for four sites, and a survey for potential sites (previously omitted) is complete for one county.

Status

The percent of project completion is summarized by Figure 2. Because tasks vary in time and manpower requirements, overall percentage completion figures by site are not simple summations of the percentages completed for each task. Overall percent completion is based on the percentage of manhours expended on tasks versus the estimated manhour requirements shown in the final column of Figure 1.

Plans

During the next reporting period, it is estimated that field work will be completed through Task 8 for all sites. The final reporting period will be utilized to complete the work for Tasks 9-11, and prepare the final evaluation and analysis.

TASKS

Site	0	1	2	3	4	5	6	7	8	9	10	11
Lowndes	=========			========								
Columbus	=========	=========		========	==========							
Clay	=========	=========	=========	========	==========					========		
Monroe Co. Airport	=========	=========	=========		==========							
Amory	=========	=========	=========		==========							
Smithville	=========											
Fulton	=========			========								
Paden #1	=========	=========	====									
Paden #2	=========	=========	====									
Burnsville	=========	=========	====		==========							

Figure 1. Defined tasks, and percent completion by sites and tasks

TASKS

Site	0	1	2	3	4	5	6	7	8	9	10	11	Estimated Overall Manhour Expected
Lowndes	100	0	0	100	0	0	0	0	0	0	0	0	8
Columbus	100	100	0	100	100	0	0	0	0	0	0	0	13
Clay	100	100	100	100	100	0	0	0	0	100	0	0	15
Monroe Co. Airport	100	100	100	0	100	0	0	0	0	0	0	0	13
Amory	100	100	100	0	100	0	0	0	0	0	0	0	13
Smithville	100	0	0	0	0	0	0	0	0	0	0	0	2
Fulton	100	0	0	100	0	0	0	0	0	0	0	0	8
Paden #1	100	100	50	0	0	0	0	0	0	0	0	0	6
Paden #2	100	100	50	0	0	0	0	0	0	0	0	0	6
Burnsville	100	100	50	0	100	0	0	0	0	0	0	0	8
% task completion	100	70	45	40	50	0	0	0	0	10	0	0	
% total manhours	2%	6%	8%	5%	7%	10%	8%	9%	7%	13%	15%	10%	

Figure 2. Percentage task completion, and estimated project manhours alloted by tasks

II. Remote Sensing Data Analysis Support Systems Objective

It is the objective of this effort to provide the data collection and processing capabilities necessary to support the various demonstration projects and to provide a low-cost operational center so that such projects can have continuing input into the overall objective of the Applications Program, both for present and future use.

Accomplishments

Since the last semi-annual progress report, most of the data processing and data analysis effort has been directed at developing a complete system for processing and classification of the LANDSAT tapes. This has now been accomplished (although some enhancements are still needed).

The system consists of three basic subsystems--training sample selection and analysis, classification, and graphic display of results.

The first subsystem selects and analyzes training samples for later use in classification. Aerial photographs and ground truth maps are studied and areas of known ground cover such as pine, hardwood, roads and water are defined. These areas are referred to a coordinate system. Registration points to correlate the training samples to equivalent LANDSAT areas are also included in the digitized data. The digitized points are edited and checked for accuracy. Next the corrected data points are converted to LANDSAT pixel coordinates and the spectral signatures for each training sample are defined. Detailed statistical analyses assure homogeneity and applicability of the samples.

The second subsystem provides for classification of the LANDSAT data into ground cover types. Each pixel of the LANDSAT image is examined and linked to the class of ground cover which it most closely resembles. This is accomplished by comparison of spectral signatures between individual LANDSAT pixels and ground cover classes.

The third subsystem provides for graphic display of the results. The underlying goal of the image display routines is to provide the user with a valid, flexible and effective means of visual display. At present the image display routines support use of the line-printer for representation of LANDSAT images. Figure 1 gives an overview of the system.

Current Status

Documentation for the LANDSAT processing and classification system is currently under development and should be ready in the near future. The system is being used extensively for support of the Sixteenth Section project.

Work on refinements to the CALUP system (described in earlier progress reports) is continuing in order to effectively support the Lowndes County Land Use Planning project.

Future Plans

Future plans center primarily on enhancements in the classification algorithm and in the display capabilities. The display equipment described in the last progress report and the management proposal has now been formally requested through appropriate channels. Installation of the equipment will probably occur early next fall. This equipment will greatly improve the entire classification and display process.

Several new classification techniques are being examined and extensive testing of these as applied to specific demonstration projects is planned.

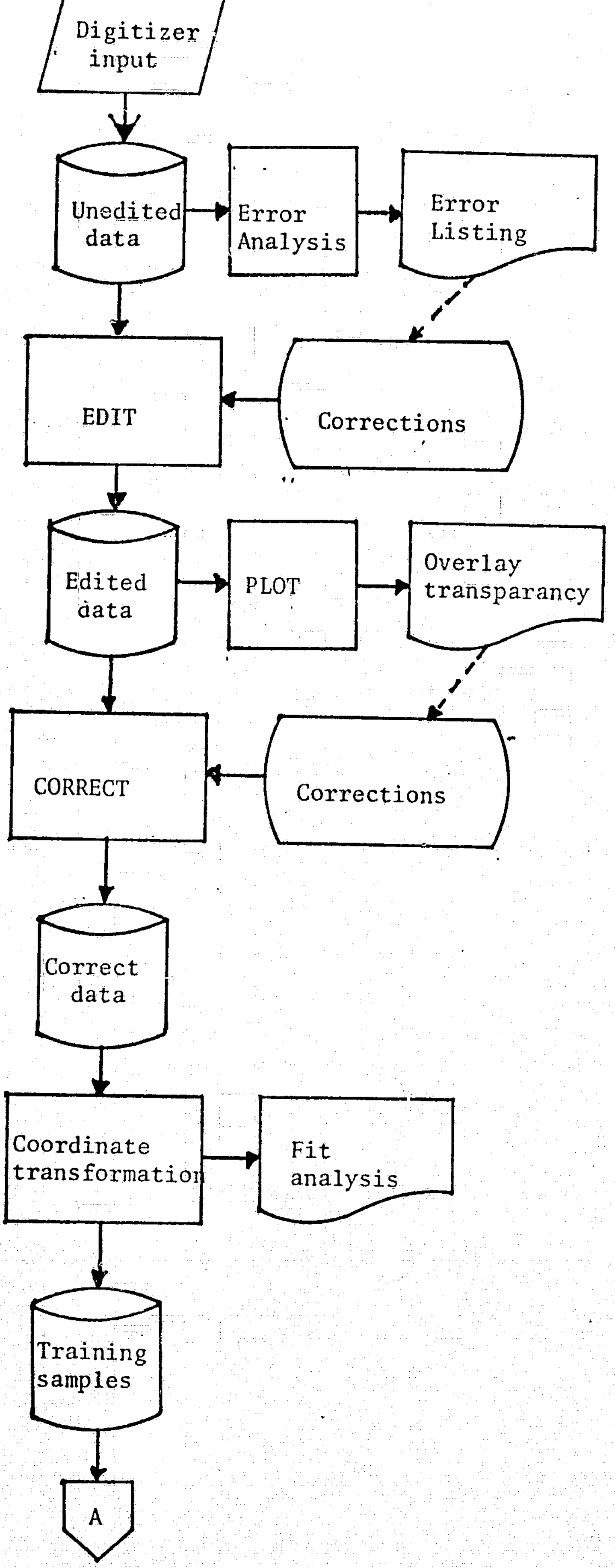

Figure 1. Processing System for Classification of LANDSAT Tapes

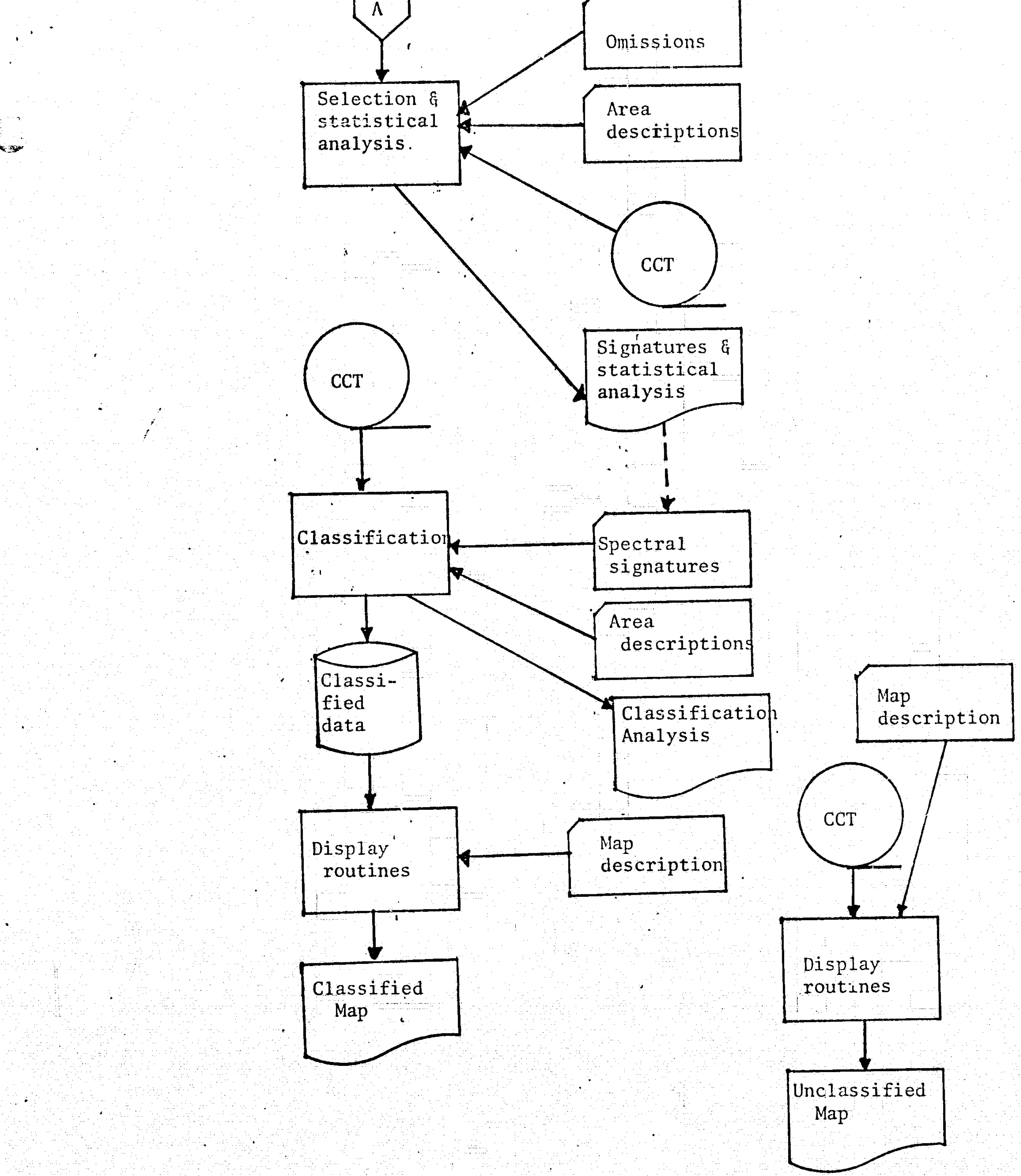

Figure 1 (Continued)

III. LIST OF SPECIAL ASSISTANCE OFFERED

As in the past, assistance in the form of data products, resource material, training, and equipment use was provided to both faculty and students from various departments of the University such as Geology and Geography, Wildlife and Fisheries, Forestry, Archeology, Landscape Architecture, Computer Science, and Agronomy. Also receiving assistance were agencies such as the U.S. Forest Service, Yazoo-Little Tallahatchie Flood Prevention Project, and private consultants.

Additional work was also performed for the Division of State and Private Forestry of the U.S. Forest Service dealing with Southern pine beetle infestations.

Information or publications from the Program were supplied to the following people or agencies:

Ecology Consultants, Inc.

Oak Ridge National Laboratory, Oak Ridge, TN

Department of Computer Science, Montana State University

Lee Gustafson, Deere & Company, Moline, IL

Department of Agricultural Engineering, Univ. of Calif., Davis

Nature Conservancy, Washington, D.C.

As in the past, Program personnel cooperated closely with the Governor's Office of Science and Technology, and the Mississippi Game & Fish Commission on the Pascagoula project. The Commission has the responsibility for developing management plans for the 33,000 acre tract which was purchased by the State of Mississippi.

IV. SHORT COURSES AND WORKSHOPS

There were no formal extension activities during this period.

APPENDIX 1

Magnolia State Clipping Service
P. O. Box 12463
Jackson, Mississippi 39211

NATCHEZ DEMOCRAT
Natchez, Mississippi

DAILY

JUL 8 1974

Park site debate today

By ALVIN BENN
Managing Editor

Fourth of July activities are over, but there could be some belated fireworks this morning when Mississippi Parks Director Bill Barnett appears before the Board of Aldermen.

The sparks have been flickering for months in a controversy over location of a new state park in Adams County and Barnett will offer his position before the city and interested citizens at 11 a.m. at City Hall.

Barnett, at the invitation of the board last month, agreed to appear and state his feelings on location of the $3 million park, part of a $25 million legislative appropriation two years ago designed to upgrade 16 existing parks and build three more.

Location has been the bone of contention from the beginning with two factions vying for attention. One favors a site in the county while the other has supported an Under-The-Hill project which would develop the state's most historic area after years of neglect.

A committee of civic leaders, appointed by the chamber of commerce, has been assisting the parks commission in selecting an eventual site. Most of the committee members favor a location in the county.

"Under-The-Hill has great historic and commercial possibilities, but it also has poor access and limited acreage," said Realtor Joe Greer. "We just flat don't have enough room there."

Greer said if a state park is to be built in Adams County "we're going to need elbow room."

He said he favors a county park centered around a water-based attraction for outdoorsmen as well as picnickers and nature lovers.

D. A. Biglane, an influential Natchezian and not a committee member, is among those favoring development of Under-The-Hill.

"It would be a nice thing for the city and for the tourists," said Biglane. "For the amount of money available it would be better to put it Under-The-Hill than in the county."

Biglane said he owns property in the Hill area and would be willing to donate some of it for a park.

"It wouldn't hold up construction on that point," he said.

The city has already gone on record favoring donation of land for an Under-The-Hill park project.

Site selection is in the process following the signing of a contract with NASA for research to be do[ne] satellite photography of the ar[ea] well as others in the state.

Mississippi State is coordinati[ng] aerial project.

Both sides in the dispute a[re ex]pected to be represented a[t] meeting this morning and will [give] varying viewpoints during a que[stion]-and-answer session which is to [follow] Barnett's address.

In addition to the parks matter board will also accept bids to cons[truct] an earth embankment on Lumb[er] where rains have washed away area in the back of several h[omes] atoop a bayou.

e confirmed

park officials draw fire

UNDER FIRE- Bill Barnett, executive director of the Mississippi Park Commission, fields questions from angry landowners, following his announcement Friday that a $3 million lake park will be located in the Stanton area. (Democrat photo by Rhett Powell)

By OLLIE REED JR.
Democrat Staff Writer

State Park officials announced the site selected for a $3 million Adams County lake park at an emotion-charged meeting Friday.

Bill Barnett, executive directorof the Mississippi Park Commission, told a group crowded into the board of supervisors' meeting room that the site was in the Stanton area.

Barnett's announcement confirmed an article in The Democrat earlier this week.

An audience, including members of the area legislative delegation and irate landowners, listened to Barnett explain how the site was determined.

"More effort was put into the site selection of this park than any we have seen," Barnett said. He said an on-the-ground survey was combined with information gathered by the National Aeronautics and Space Administration's telecommunication satellite.

The data was categorized and programmed for computer analysis by the Mississippi State University Forestry Department, Barnett said.

He said 11 different sites had been considered for the park's location.

"Like a giant funnel, it all narrowed down to this site with no major questions at all," Barnett said. "This is the only logical location in the entire study area - it really is."

"We still don't know exactly what land we will use, but we do know generally where the dam will be located," he said. "There is nothing definite about the acreage involved. It will be somewhere between 2,500 and 3,000 acres."

Barnett said negotiations for property are expected to last until November, and construction is expected to start in May, 1976 and continue for a year.

He said the site will be developed into a good, general recreation park, containing a 650 acre lake.

Barnett said Bob Bell, former chief of the State Highway Department's land-acquisition branch, will deal with landowners.

"Everybody in this area will have individual attention," Barnett said. "It is an awkward thing trying to do something for the community when you are going to have to catch some people."

Barnett himself caught a blast of questions and accusations from angry landowners at the meeting.

Mrs. Charles Wheat, who said she and her husband had planned to move onto 116 acres they own in the area, asked if it was possible to alter the location of the park slightly.

"You are moving people off this land who have always lived in the country," she said. "If you moved your park back into the hilly land it would not be affecting these people's homes."

Barnett said the site selection was the result of a "purely objective" study, and the designated area was the best possible choice. He said, however, that arguments of landowners will be considered.

State Rep. Walter Brown told landowners that the law demands they receive just compensation for their property and he was sure they would.

"I have been waiting to move onto

(See State park, page 9)

State park

(Continued From Page 1)

my land for 24 years. What will compensate me for those years of waiting," Mary Blackmon said. "Who is going to help us?"

Several persons asked if there are any plans to relocate residents in the area.

"I don't see that you have the right to move people off their land," Mrs. Wheat said.

"Where am I going to go when you put my house under water," one man asked.

"I'll soon be 70 years old, I can't make a new start. What am I going to do," another resident of the affected area asked.

J.D. Smith, 67, who retired from Armstrong Rubber Co. after 30 years, said he bought some land in the site area five years ago and built a house there last summer.

"They're getting every acre I've got," he said.

Barnett expressed his sympathy to the landowners and told them the situation would be handled so that it would have the least possible impact on each individual.

Surveyors told The Democrat Monday that about 5,000 acres in the Stanton area were being studied. They said the area is bordered roughly by the Illinois Central Railroad on the north, a line 2,000 feet inside the Stanton-Fenwick Road on the west, the Cranfield Road on the south and the Cannonsburg Road on the east.

Tom Wetzel, the park service's chief planner, told the gathering that a 650 acre lake was necessary to provide a variety of recreational activities.

"Water skiers and bass fishermen don't like each other," Wetzel said.

APR 17 1975
(DATE)

New Park to Open in Natchez

William M. Barnett, Mississippi Park Commission Executive Director announced today in Natchez the location for the new state park to be developed in Adams County. The site for the new park, funded by HB 660, a 1972 25 million dollar state park development measure, is located in Township 7 and 8 North and Range 1 West in Adams County.

The new state park is the result of many months of investigation and analysis by L.T.A. Limited, Planning Consultants and Landscape Architects, Jackson, Mississippi. In addition to the conventional analysis and investigation Planners and Landscape Architects apply in the selection of prime developable sites, the National Aeronautics and Space Administration's (NASA) Earth Remove Telecommunication Satellite (ERTS) was used to collect specific data related to potential park sites.

The data was categorized and programmed for a computer analysis and was conducted by the Mississippi State University Forestry Department. The program derived by the Mississippi Park Commission, L. T.A. Limited, and Forestry Department staff and graduate students includes the following data: Existing conditions, transportation, location, physiographic aspects, soils, hydrology, vegetation, natural resources and vunerabilities as related to use and attractiveness. All the collected data was recorded on composite U. S. Geological Survey grind maps by the computer for the entire area of Adams County.

Through a series of overlays and comparisons, L.T.A.'s Planners and Landscape Architects arrived at eleven initial sites capable of supporting future park development. Eash site was taken through a much more exhaustive series of analysis, narrowing the selection to seven sites.

Capitol NEWSPAPER
CLIPPING BUREAU
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JACKSON, MISS. 39206

Clipped from:
Port Gibson Reveille
Port Gibson, Miss.

APR 17 1975
(DATE)

Natchez park site chosen

Natchez Area Park Site Announced

William M. Barnett, Mississippi Park Commission executive director announced Monday in Natchez the location for the new state park to be developed in Adams County. The site for the new park, funded by HB 660, a 1972 25 million dollar state park development measure, is located in Township 7 and 8 North and Range 1 West in Adams county.

The new state park is the result of many months of investigation and analysis by L.T.A. Ltd., planning consultants and landscape architects, Jackson.

In addition to the conventional analysis and investigation the planners and landscape architects apply in the selection of prime developable sites, the National Aeronautics and Space Administration's (NASA) Earth Remote Telecommunication Satellite (ERTS) was used to collect specific data related to potential park sites.

The data was categorized and programmed for a computer analysis and was conducted by the Mississippi State University Forestry Department. The program derived by the Mississippi Park Commission, L.T.A. Ltd., and Forestry Department staff and graduate students includes the following data: Existing consitions, transportation, location, physiographic aspects, soils, hydrology, vegetation, natural resources and vulnerabilities as related to use and attractiveness. All the collected data was recorded on composite U. S. Geological Survey grid maps by the computer for the entire area of Adams County.

Through a series of overlays and comparisons, L.T.A.'s Planners and Landscape Architects arrived at eleven initial sites capable of supporting future park development.

Each site was taken through a much more exhaustive series of analysis, narrowing the selection to seven sites. Further investigation eliminated all but three sites. Then following an indepth survey conducted in the field, the most conductive site for park development was selected.

"We are very anxious to proceed with the acquisition of land for the park," Mr. Barnett said. "This action is scheduled to begin immediately."

"In an effort to expedite the development of the new park," Barnett continued, "Tom Spencer and Associates are under way with contour mapping of the area which is essential to the preparation of the final master plan for the park."

L.T.A. Ltd. of Jackson will be responsible for preparing the master plan once the contour mapping is completed. They will work in cooperation with the Mississippi State University Forestry in arriving at a master plan to best utilize the site selected for the new park.

The time schedule for development is for the topographic mapping to be completed by June 30, 1975; the master plan completed by November 30, 1975 with construction being complete by May, 1977.

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Clipped from:
Meridian Star
Meridian, Miss.

APR 15 1975
(DATE)

Adams County Chosen For Park Site

NATCHEZ — A new state park will be located in Adams County, according to William M. Barnett, Mississippi Park Commission executive director.

The site of the park, to be funded by a $25 million state park development measure, was chosen by L. T. A. Limited, planning consultants and landscape architects of Jackson. The developers were aided in the eliminaion of other potential sites by the Mississippi Park Commission, Mississippi State University Forestry Department, and the National Aeronautics and Space Administration's Earth Remote Telecommunication Satellite.

"We are very anxious to proceed with the acquisition of land for the park," Barnett said. "This action is scheduled to begin immediately."

Topographic mapping of the site is to be completed by June 30, the master plan completed by November 30, and construction finished by May, 1977, officials said.

Capitol NEWSPAPER
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Vicksburg Evening Post
Vicksburg, Miss.

APR 14 1975
(DATE)

Agency Readies New State Park

NATCHEZ — Land acquisition will begin immediately for a new $25 million state park to be completed in Adams County by May, 1977, according to Executive Director William M. Barnett of the Mississippi Park Commission.

Money for the new park was authorized by the legislature in 1972 and its location was selected following months of analysis, including data collected by a NASA satellite, Barnett said.

He said topographic mapping should be completed by June 30 and a master plan will be

APPENDIX 2

MPC

MISSISSIPPI PARK COMMISSION • 717 ROBERT E. LEE BUILDING • JACKSON MISSISSIPPI 39201 • 601/354-6321

March 30, 1977

Professor W. Frank Miller
Program Coordinator
Remote Sensing Applications
Mississippi State University
P. O. Drawer FD
Mississippi State, Mississippi 39762

Dear Professor Miller:

The Mississippi Park Commission has recently established the Natchez State Park Advisory Committee for the purpose of providing local public input to the planning process. In that regard, on March 26, 1977, I had the opportunity to explain to the Committee, the site selection technique utilized in determining the location of Mississippi's newest state park.

I would like to report to you that the Committee was extremely interested and impressed by the computer assisted procedures used and the role that NASA technology and Mississippi State University played in selecting the appropriate park location and in determining the site characteristics of the selected location.

The information gathered through the utilization of high-altitude color infrared imagery and the CALUP program has been used by the Mississippi Park Commission in making almost all planning decisions as I explained to the Committee. I would estimate that this technique, as applied to the task of rationally locating a state park has saved the State of Mississippi approximately $40,000 to $50,000,and one and one half years in accomplishing the location phase of the project and approximately $15,000 to $20,000 and six months in providing indepth site data. With this valuable data available, the master plan consultant will be better able to concentrate on the appropriateness of proposed facilities as determined by land capability.

The Mississippi Park Commission is fortunate to have had the opportunity to take advantage of NASA technology and the expertise and assistance of Mississippi State University. The Commission hereby expresses its appreciation to all agencies and individuals involved.

Professor W. Frank Miller
Page 2.

I have enclosed, for your information, copies of a few of the past news articles from throughout the state concerning the park location selection methodology and understand that the Natchez Democrat plans a feature article in the near future. I am also returning six color transparancies as promised.

I personally appreciate your interest in the project and the Mississippi Park Commission, and I look forward to future professional associations on similar projects.

Sincerely yours,

Thomas A. Wetzel

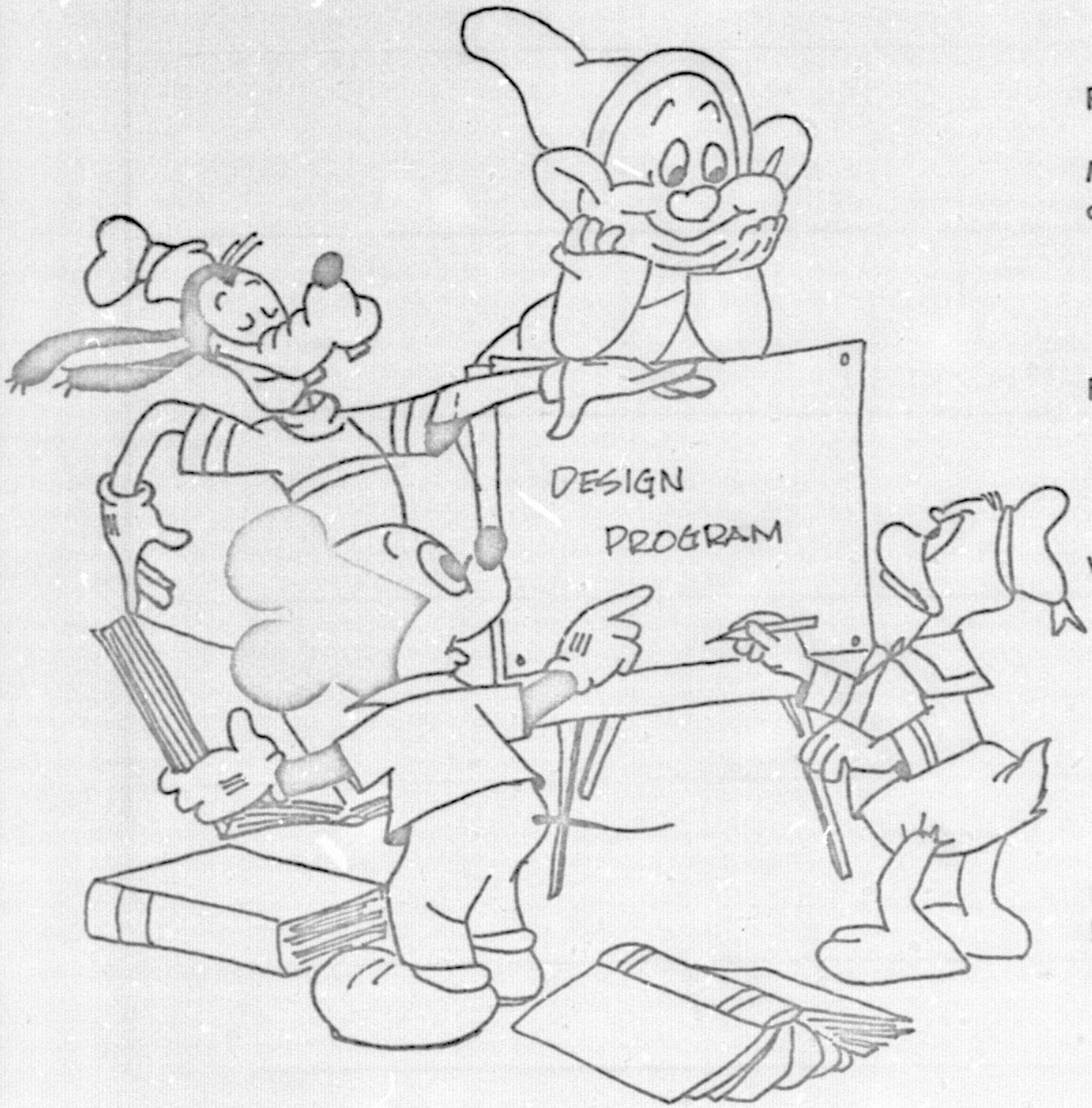
Thomas A. Wetzel, Director
Planning and Engineering

TAW/lj
Enclosures

APPENDIX 3

PUBLIC AND PRIVATE FACILITIES FOR A PLANNED UNIT DEVELOPMENT, AN INDUSTRIAL PARK AND A RECREATIONAL COMPLEX

Adams and Jefferson Counties, Mississippi



Prepared for:

Mississippi Agricultural and Industrial Board
and...
The Mississippi State Park Commission
Adams and Jefferson Counties, Mississippi
U. S. Department of Interior

Prepared by:
Keith Clopton
Dan Funderburk
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With the assistance of:
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Department of Landscape Architecture
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Dr. Bradley L. Carter
Department of Computer Science
Mississippi State University

In accordance with the requirements for Advanced Landscape Design I, Department of Landscape Architecture, Mississippi State University, October, 1976.

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F O R E W O R D

The four members of our research team realize that the undertaking of any large scale project requires a great deal of organization. This necessity for organization suggests the need for a step-by-step process. Our team's procedure has been:

1. Holding meetings to select clients and land use development types for the study area.
2. Setting up sequential progression of the design process and allocating a time frame for the progression through the use of a PERT/CPM time estimate chart. (See Figure #1)
3. Formulating the design concept by use of group methods.
4. Stating of overall project goals and objectives.
5. Uncovering of factual data and relating this data to the study area.
6. Assigning definitions to proposed land uses.
7. Inventoring data and applying this information to the proposed land uses.
8. Applying selected variables to selected land uses.
9. Formulating models and running models through computer.
10. Adjusting models and making necessary computer re-runs.
11. Drawing of maps based on the computer print-outs.
12. Dissolving of the team and pursuing of individual master plans.

Further development of these individual steps will be discussed as they occur in this design program.

PERT/CPM

Time Estimates:

Ta = Optimistic time, minimum time necessary to complete an activity.

Tm = Most likely time, normal time necessary to complete an activity.

Tb = Pessimestic time, maximum time necessary to complete an activity.

Te = Activity time

PROJECTED:

Time based on 8-hour day.

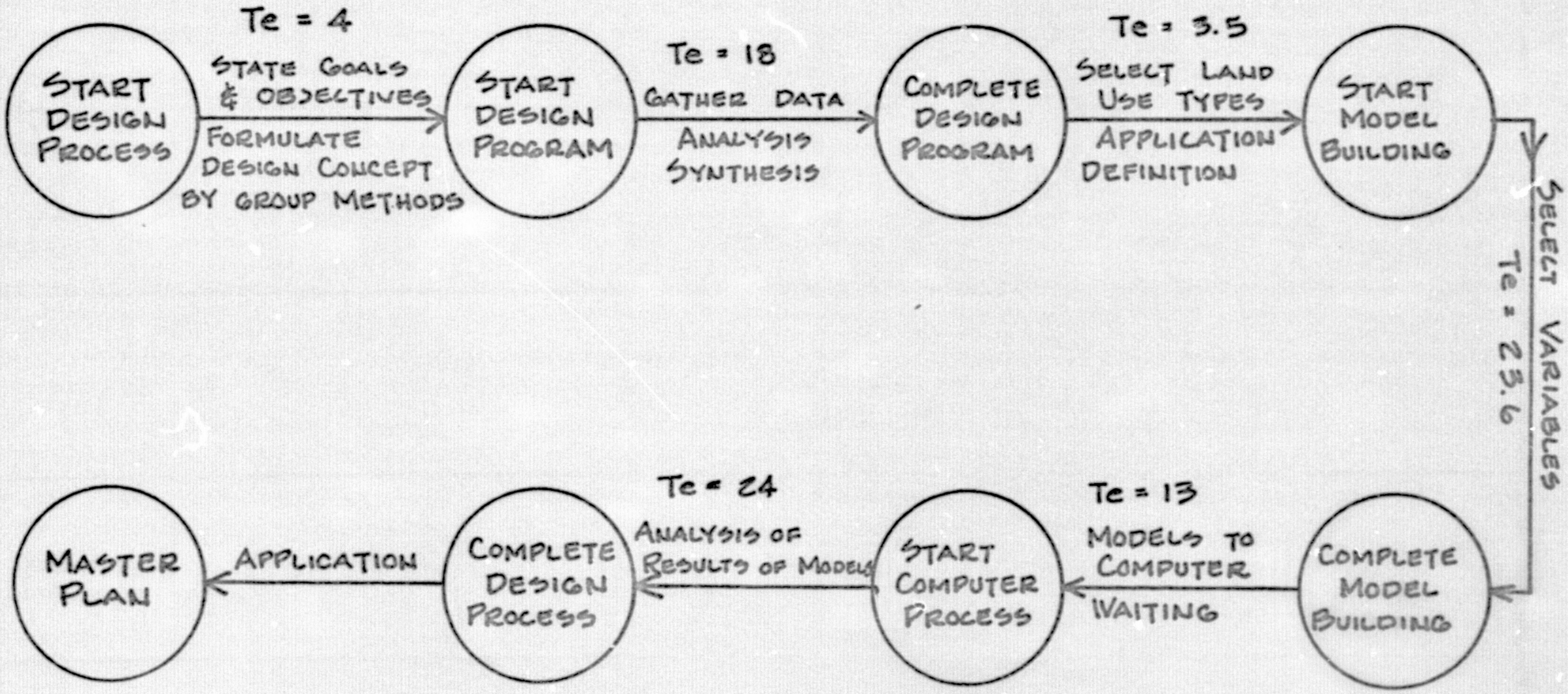


Figure #1a

PERT/CPM, continued

The Ta, Tm, and Tb time estimates are used in the PERT/CPM formula ($\frac{ta + 4tm + tb}{6}$) to figure out the activity time, te, that the project will take from the beginning of the design process to the completion of the computer process. Ta, Tm, Tb and Te are expressed in hours.

ACTUAL:

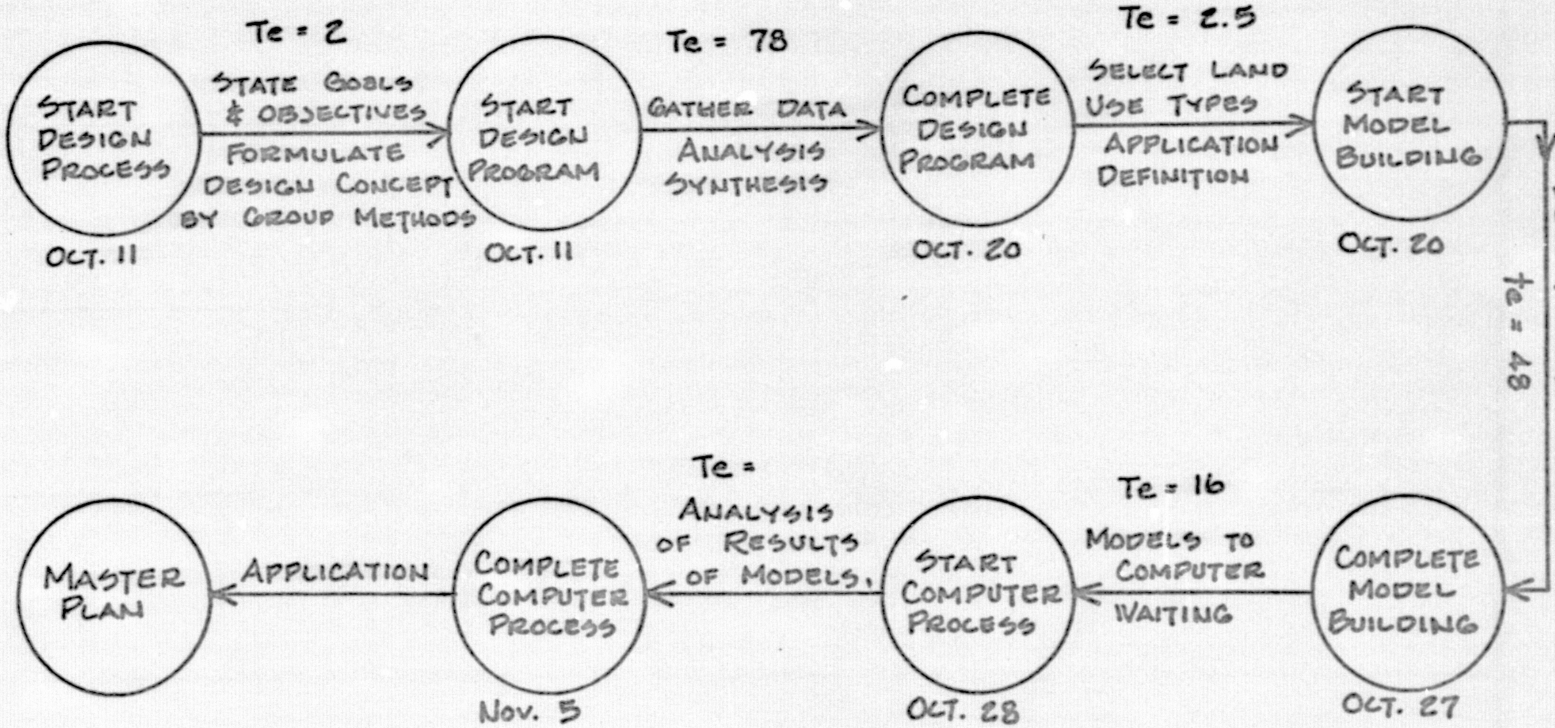
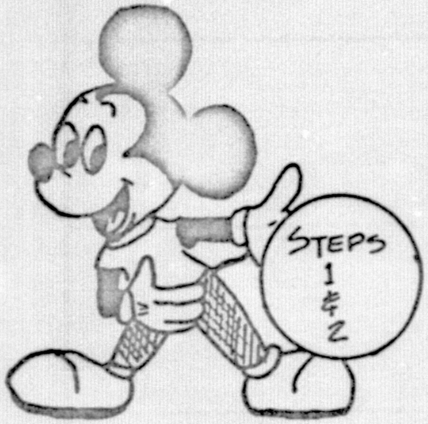


Figure #1b

For ease of location and recognition, these steps will be indicated by the use of the corresponding numbers listed above combined with a figure similar to the one below.

INTRODUCTION



This study is an attempt to formulate a successful working relationship between three major land use developments. The three land uses consist of a Planned Unit Development (PUD), an Industrial Park, and a Resort Complex; this land use development is being produced for and with the cooperation of the Mississippi Agricultural and Industrial Board. The Southwest Planning and Development District will serve as a source of potential clientele for the study area.

Our individual group, serving as a planning and coordinating team, accepted the established land development types and derived a general concept. Our concept is one of a community which provides a living - working - playing relationship through the integration of industry, recreation, and a planned unit development as indicated in the illustration below.

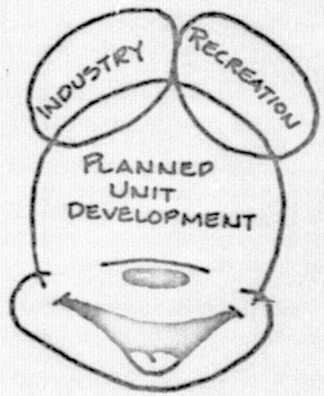


Figure #2

Our "Mickey Mouse" illustration is used to show an analogical relationship of the land use effects upon one another. The "Mickey Mouse" concept graphically supports the relationship of our specified land uses and will be explained as progression is made toward the implementation of our design concept.

Basically, the family and its home environment is defined, for the purposes of our development, as the nucleus of all activity. This fact stems from the idea that the family unit not only provides interaction between its members, but serves as a base for the interaction of working, living, and playing activities in society itself. Therefore, through our team's generation of thoughts and ideas based on this "nucleus theory," we developed an additional land use relationship which is depicted below. (Figure #3)

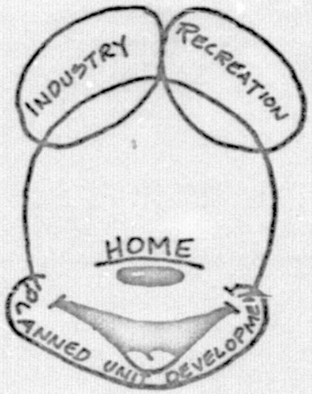
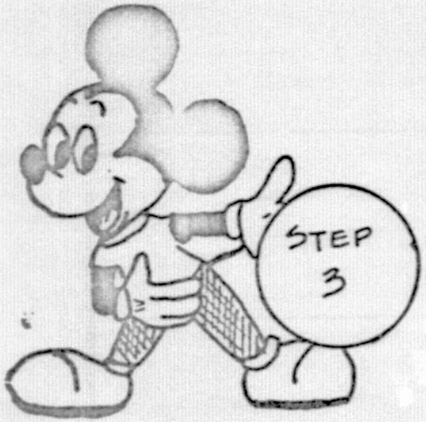


Figure #3

Hence, the prospective residents within the P.U.D. will serve as a potential source of tying the three land uses into a functional and flexible unit. The functional and flexible aspects of the unit development

are to be depicted as we progress in our definitions of land uses and their relationships.

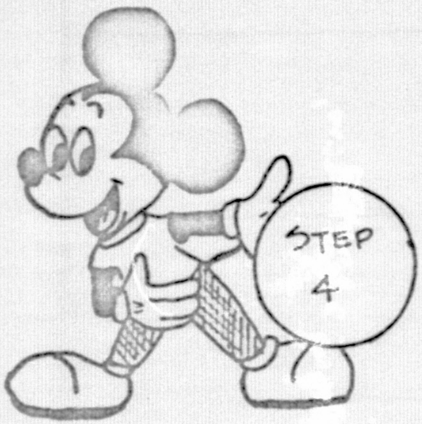
DESIGN CONCEPT



As our planning team progresses considering all interrelating components and elements of our concept, a base will be produced for the development of a final master plan. Our team's aim for this base is to relate the mechanisms and processes used by the team in order to achieve our concept of a developed environment where nature and man can work together. In order to achieve this aim, it is essential to arrange the reasoning processes and our group's deductions from numerous sources into an organized program. The material presented in this program depicts the investigation, the analysis, and the synthesis of resource material in order that a computer analysis of this information can be made from compiled group data. From the computer analysis, potential sites for land use areas should result.

Through the development of our team's concept of the multi-use area, design criteria or guidelines are set for the formation and attainment of overall project goals.

PROJECT GOALS



The project goals determined by the members of the research team are:

*To obtain maximum land use development through proposed facilities while sustaining minimum amount of impact to the environment, i.e. air, soil, water, wildlife, and vegetation.

*To create an environment where man and nature can work together.

*To promote tourism within our target area through the use of proposed recreational facilities.

*To coordinate land uses in order to provide functional relationships between residents, workers, and visitors.

*To protect, preserve, and enhance the social, cultural, economic, and natural values that exist in the study area.

*To retain patrons by the functions and attractiveness of the developed land uses, yet not limit the users to any specific land use area.

*To create three individually unique areas which are built to be flexible in support of one another.

OBJECTIVES

Objectives of the project have been developed by the research team after considering and expounding on the concept and project goals. These objectives are means for attaining our goals, they will also serve as guidelines to direct the team members in creating individual master plans. The following objectives have been formulated:

*To use the computer as a tool for environmental analysis of the study area.

*To incorporate computer analysis of the selected variables with the attractiveness criteria set up by the research team.

*To use graphic information to outline historic aspects contained within the site as a base.

*To balance industrial and recreational facilities by the integration of a P.U.D. within the site.

*To create public recreational facilities in order to cater to the leisurely needs of both tourists and

residents.

*To use transitional areas within the site to create circulation into and through the three areas.

*To relate areas by graphic information, circulation corridors and existing natural features.

*To create community activity centers in natural surroundings.

*To use the historical significance of the area as a base for an interpretive center thus drawing visitors to the resort areas.

So that these project goals and objectives can be applied to our study area, a great deal of critical data concerning the site and it's surrounding area is needed. With the relative collected data, our research team will be able to further develop and understand the facilities and needs of the area users.

The Study Area Location

The land designated as the study area for the purpose of our project encompasses approximately fifteen square miles. The town of Fenwick lies on the Southwest corner of our site. (See Figures 4 and 5)

MISSISSIPPI HIGHWAY LOCATIONS

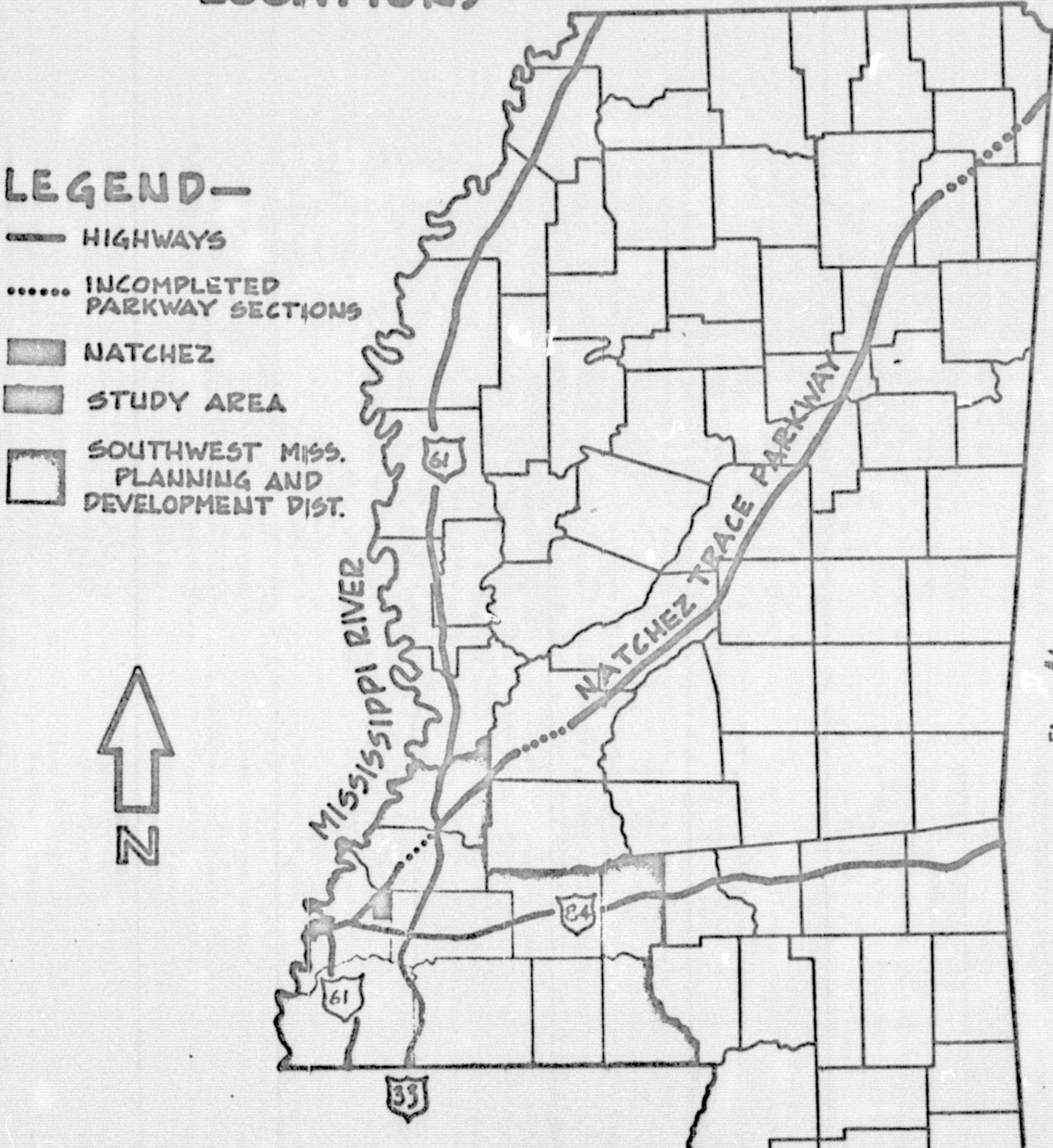


Figure #4

Figure #4

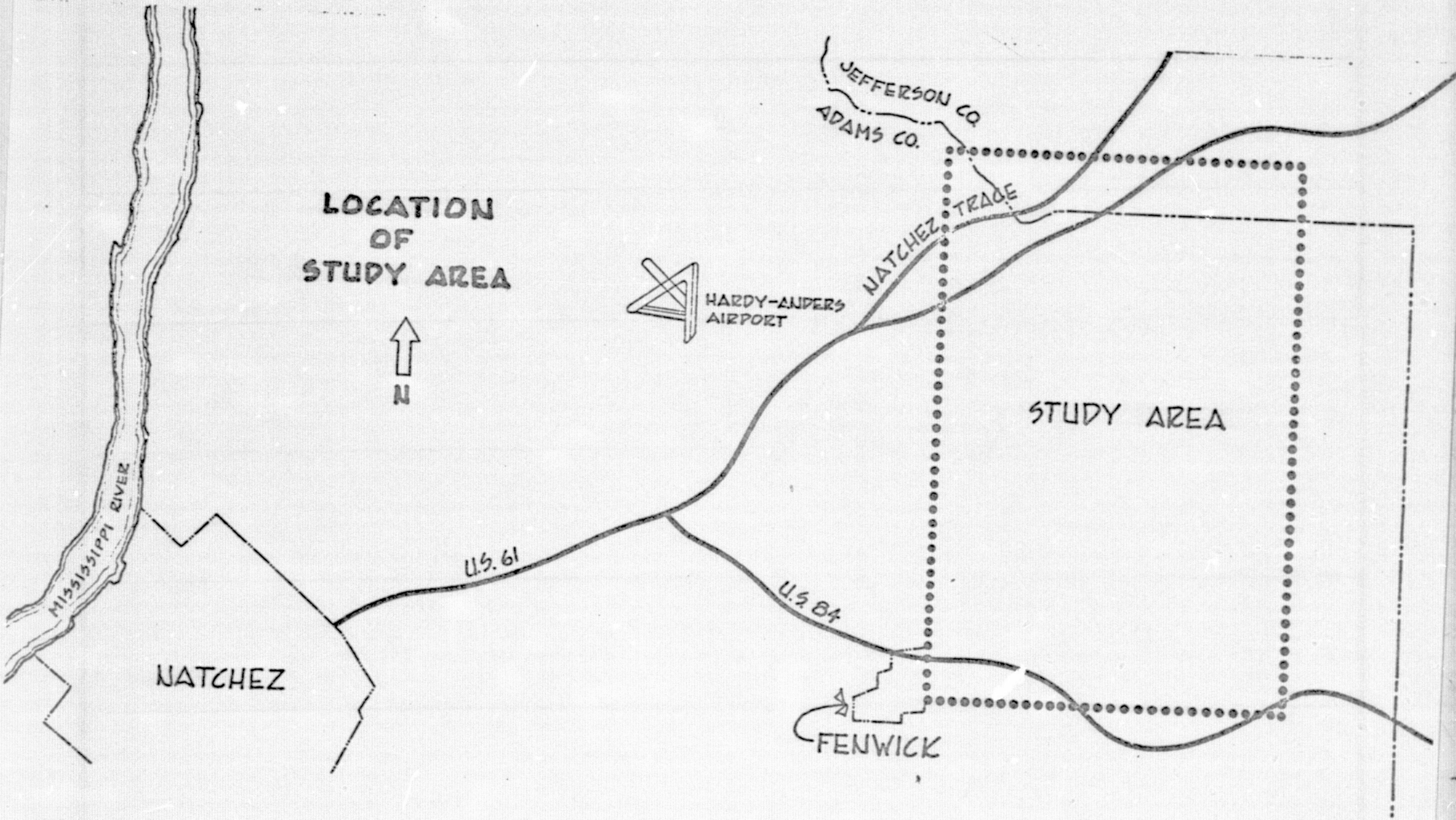
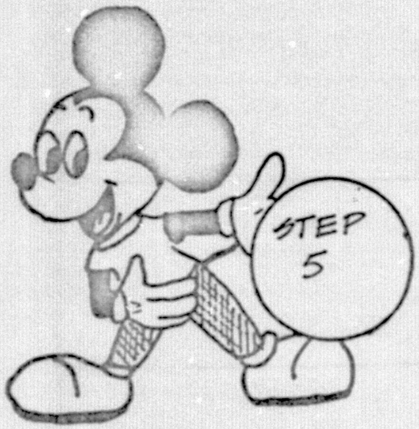

LOCATION
OF
STUDY AREA
N
JEFFERSON CO.
ADAMS CO.
NATCHEZ TRACE
HARDY-ANDERS
AIRPORT
STUDY AREA
MISSISSIPPI RIVER
U.S. 61
U.S. 84
NATCHEZ
FENWICK

Figure #5



Socio-Economic Aspect

Existing socio-economic aspects are those factors, both social and economic which pertain to such data as: education, population, transportation, labor force, utility service, etc. Investigation of these factors supply our research team with a knowledge of the existing services and demographic data that help set a base for the needs of the area users.

One of the sources for this data base is a Mississippi Agricultural and Industrial Board publication, Statistical Information on America's New Frontier. The material obtained from this source confirmed our belief that existing socio-economic conditions in the Natchez area would accomodate the proposed facilities in the study area development. These conditions and critical data will be outlined individually in the following order:

I. Transportation
   A. Highways
   B. River port
   C. Railroad
   D. Commercial Air Services

II. Utilities

III. Population

IV. Labor Force

V. Education

I. Transportation:

A. Highways

Existing transportation in and around the study area include a wide variety of highway systems. U. S. Highway 61 runs North to Memphis and South to Baton Rouge through the city of Natchez. U. S. Highway 84 approaches Natchez from the East and runs along the Southern perimeter of the study area. State Highway 33 runs North to South along the Eastern perimeter of the study area. The Natchez Trace Parkway, originating in Nashville, Tennessee, runs through the Northeast corner of Mississippi and runs Southwesterly across the state, and originally linked Natchez with Nashville. (See Figure #4).

B. Railroads

The Illinois Central and Gulf Railroad service Natchez from the East and Northeast. The Eastern Railroad Line passes through the lower third of the site and the Northeast line follows the route of U. S. Highway 61 through the study area. Another railroad service, the Missouri Pacific Railroad, approaches the City of Natchez from due South.

C. River Port

Natchez is a major port on the Mississippi River having as a base a twelve foot deep river channel. The port serves as a barge terminal for the major barge lines that serve Southwest Mississippi and adjacent Louisiana parishes.

D. Commercial Air Service

There are three commercial air service flights daily into Natchez's Hardy-Anders Airport. All of these

flights are made by Southern Airlines.

II. Utilities

Adams and Jefferson counties are served by Mississippi Power and Light Company and Mississippi Valley Gas Company. Oil and gas fields are prominent throughout both counties.

III. Population

The population of the City of Natchez according to the 1970 census is 19,704. Forth-five percent of the population are high school graduates. Blacks constitute fifty-one percent of the population. The median family income is $6,331.

IV. Labor Force

The total labor force in Natchez consists of 6,994 persons. Females make up six percent of this force. Manufacturing employs twenty-nine percent of the male labor force. There are twenty-eight manufacturing establishments which employ 1,336 persons living in Natchez.

V. Education

Educational institutions in Adams County above high school levels consist of one junior college, one senior college and various vocational schools.

Historical Significance

The Natchez-Adams-Jefferson county vicinity contains centers of and cultural importances. Numerous sites are maintained with state or private funds. Other sites and landmarks within the area have

been designated as National Historical Landmarks. Historical and archeological sites exist within the Adams-Jefferson area such as: Natchez under the Hill, Emerald Mounds, other Indian mounds, pre-civil war sites, antebellum homes, significant buildings, museums and the southern terminus of the Natchez Trace.[1] (See map). Figure #6.

The Natchez Trace originally linked Natchez with Nashville, Tennessee. To date the Trace Parkway ends between Selma and Stanton, but plans indicate the extension of the Parkway. This extension would allow the Parkway to terminate near the Natchez High School at the U.S. 84 - 61 by-pass. Present plans show an information center to be located in this vicinity.[2]

A good relationship exists between the Southern terminus of the Trace Parkway and the proposed resort area. Existing transportation facilities, historical significance and the proximity of the study area to Natchez provide an excellent basis for the promotion of the proposed industrial, recreational and residential facilities.

Co-existing Factors

The previously discussed socio-economic aspects, study area location and historical factors create a "node of interest" in the Natchez vicinity. The node of interest occurs because several differing man-made and natural features exist in close proximity and are worthy of preservation. Some man-made features such as the highway systems, port facilities at Natchez, commercial air services and types of historical sites have been previously mentioned. However, many other points of interest also exist that could be visited by tourists using our proposed resort area as a center from which tourism could radiate.

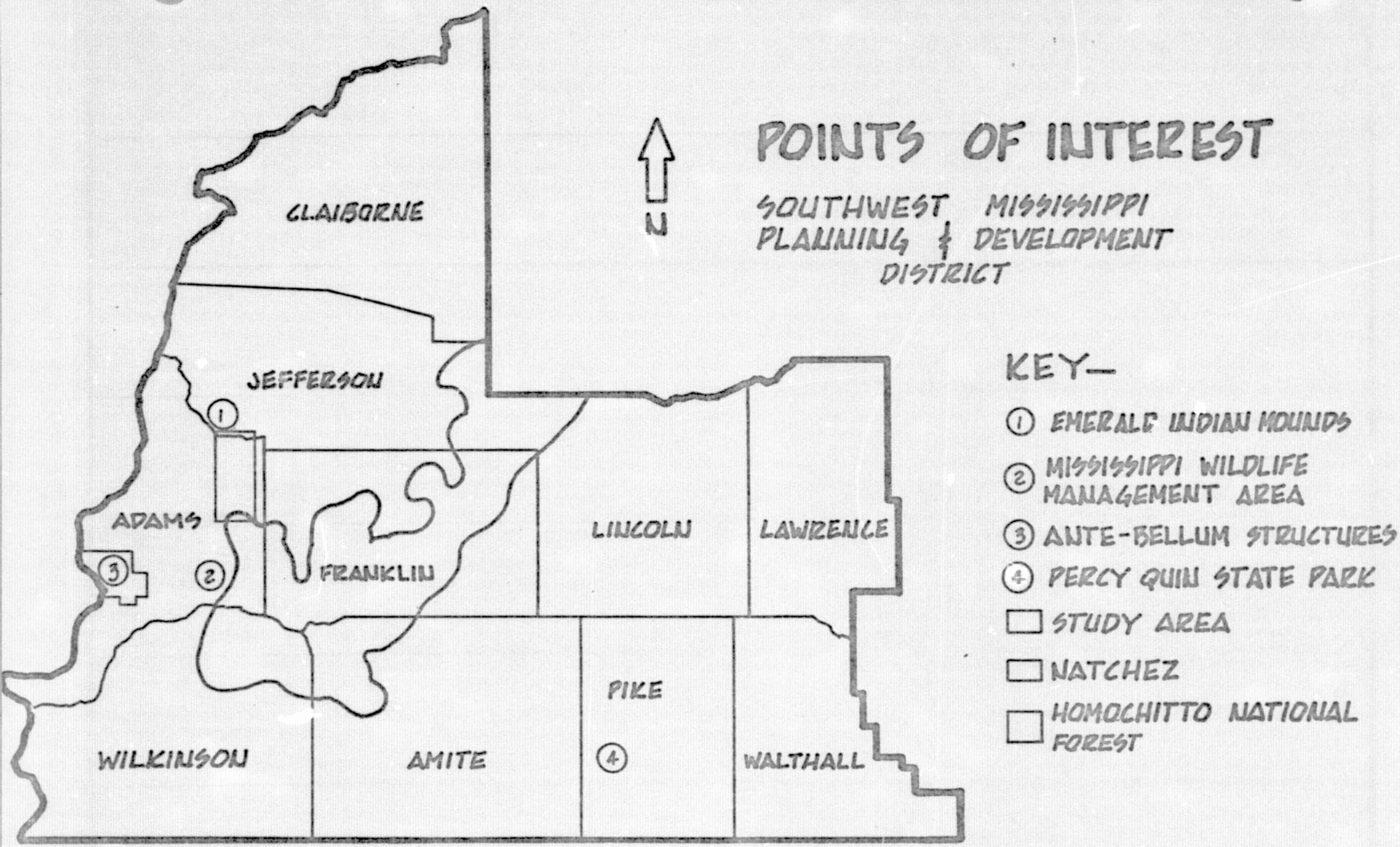

POINTS OF INTEREST
SOUTHWEST MISSISSIPPI
PLANNING & DEVELOPMENT
DISTRICT
N
CLAIBORNE
JEFFERSON
ADAMS
FRANKLIN
LINCOLN
LAWRENCE
WILKINSON
AMITE
PIKE
WALTHALL
1
2
3
4
KEY–
1 EMERALD INDIAN MOUNDS
2 MISSISSIPPI WILDLIFE MANAGEMENT AREA
3 ANTE-BELLUM STRUCTURES
4 PERCY QUIN STATE PARK
STUDY AREA
NATCHEZ
HOMOCHITTO NATIONAL FOREST

Figure #6

Some other points of interest in the surrounding area will now be discussed to further depict elements within the node of interest. D'Evereauz, Melrose, Longwood, Dunleith, Kings Tavern and several other ante-bellum structures in and around the Natchez area constitute points of interest within the Natchez Garden Club's Spring Pilgrimage. This annual event acts as the largest money-making, tourist-drawing attraction in the area. The resort facilities of the proposed development could capitilize on the tourism of the Natchez area and provide for the tourist a pleasing environment in which to visit.[3]

The existing natural features such as the Homochitto National Forest, Adams County Wildlife Management Area, the proximity of the Mississippi River and the proximity of the Gulf Coast are also elements contained within our node of interest. The existing natural areas contain many species of wildlife and fish that draw hunters and fishermen into these natural areas. Further evidence of wildlife species in the study area will be brought out in the evaluation of natural systems.[4]

The services provided by the Southwest Mississippi Planning and Development District are used by many local residents and out of state tourists who travel through the Southwestern part of Mississippi. This District contains only one existing park which is heavily used; in 1970 the park received 331,525 visitors. Such an overwhelming number of visitors each year has caused wear and tear of the park facilities and natural features. This tremendous stress of activity on the existing facilities suggests the establishment of another park development within the District.[5] (See Figure #7).

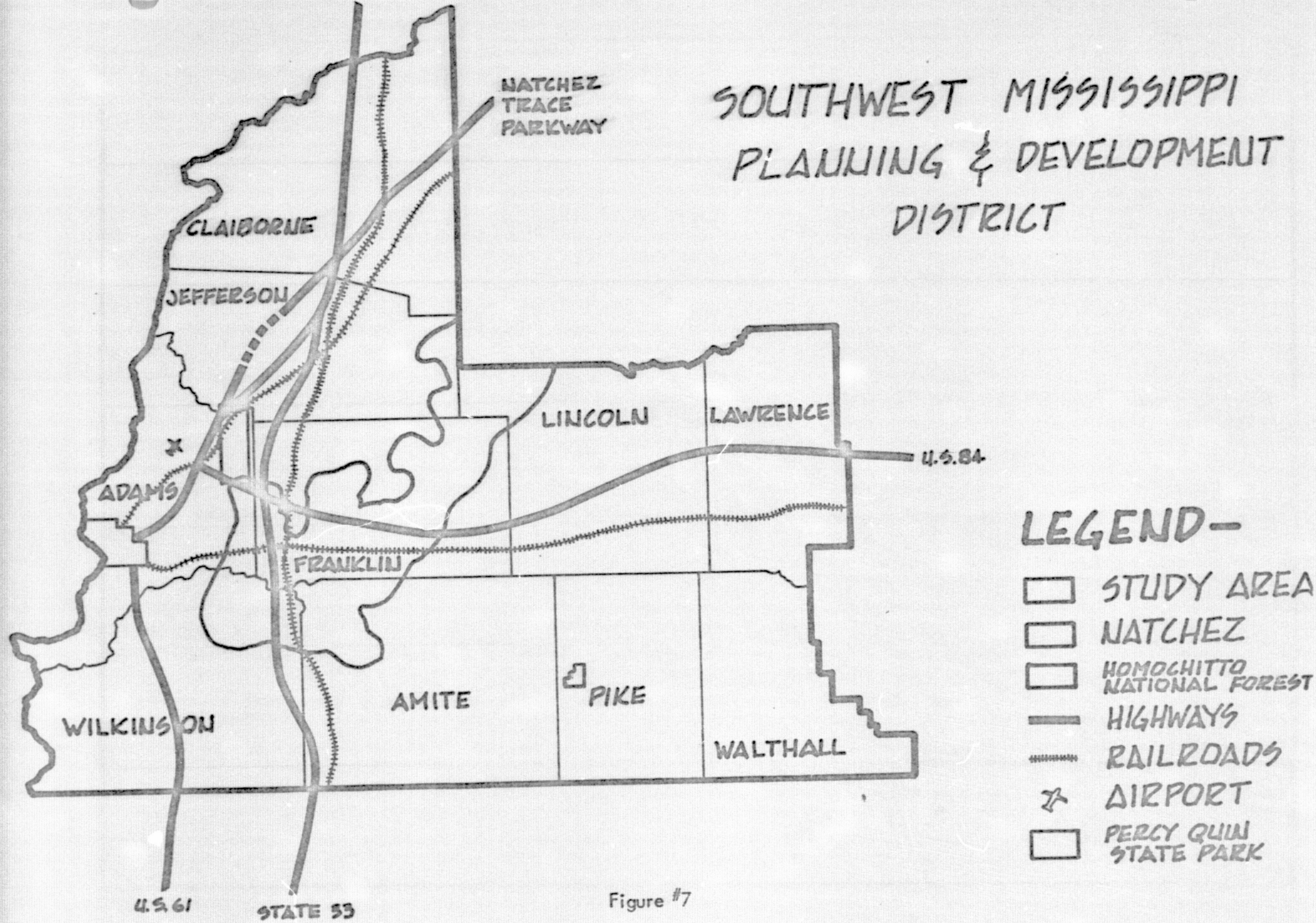

SOUTHWEST MISSISSIPPI
PLANNING & DEVELOPMENT
DISTRICT
NATCHEZ
TRACE
PARKWAY
CLAIBORNE
JEFFERSON
ADAMS
FRANKLIN
LINCOLN
LAWRENCE
WILKINSON
AMITE
PIKE
WALTHALL
U.S. 84
U.S. 61
STATE 33
LEGEND-
STUDY AREA
NATCHEZ
HOMOCHITTO
NATIONAL FOREST
HIGHWAYS
RAILROADS
AIRPORT
PERCY QUIN
STATE PARK

Figure #7

Evaluation of Impact on Natural Systems

In any development of a given study area, the designers should be concerned as to what impact the development will have on the existing natural systems. These natural systems, such as water quality, wildlife habitat, air quality, etcetera, occur in a delicate balance with each other and other factors of the total eco-system. Therefore, an in-depth data gathering process and evaluative study must be assimilated to determine the effects a development will have on a study area.

To determine the effects various land uses will have on the natural systems, we must first identify the systems being effected. They are:

1. Surface Water Quality
2. Ground Water Quality
3. Soil Erosion
4. Vegetation Stability
5. Visual Quality
6. Air Quality
7. Shoreline Habitat
8. Wildlife Habitat

The determination of these systems has been arrived at by selecting those that are most vulnerable to impact created by a Planned Unit Development (PUD), a Recreation Area, and an Industrial Park. By affecting the various natural systems in different manners, each will serve as indications of future impact on the site and will be discussed in the following system breakdown.

Surface Water Quality

Surface water may be defined as water which is found above ground level, exposed to sunlight, air, and the surrounding environment. The quality of surface water will be extremely important to any proposed

water feature for the site. Water quality must be maintained at a high level for visual appeal, recreational activity and wildlife consumption. The existing lake is to be one of the central features of the resort/recreational area. Proposed activities occuring on and about this water feature will determine to a great degree the quality of the surface water.

The proposed Industrial Park could without regulation and restriction have very adverse effects on surface water quality by pollution. Industrial water pollution stemming from a discharge of organic or bacteriological wastes can discolor water, prevent animal growth and reproduction, and inhibit recreational activity.

Likewise, a community development or P.U.D. can affect surface water quality. Sanitary sewer systems must not be allowed to empty into the existing lake or existing streams, and storm drainage systems should provide a network of collection, conduction, and disposal of excess water run off. Disposition of water run off depends entirely upon the activities that occur on the land. If soil particles from erosion or intense amounts of fertilizers are picked up in the water run off, it may be necessary to redirect the disposal of this water into a leaching field for sedimentation. It would not be desirable for this water to flow into the lake or any other surface water. Yet, if the water run off is of high quality and low in pollutant particles, it may be necessary to allow the run off to enter stands of surface water. This non-pollutant run off will contribute to the existing amount of surface water.

Many of the proposed water related activities will essentially revolve around usage of the surface water or lake. However, such land uses as a marina can, to a certain degree, cause water pollution. With the

possible escape of fuel from boat engines and pumps, slight impact will occur. Since this oil and gasoline spillage will be harmful to the cleanliness of the surface water, boaters should be careful to keep this pollution at a low level. These precautions must rely entirely on the operators of pumping situations and motor boat users. With the possible escape of fuel from boat engines and pumps, slight impact will occur. Since this oil and gasoline spillage will be harmful to the cleanliness of the surface water, precautions must be taken to ward off this pollution.

2. Ground Water Quality

Through research it has been found that moderate to large supplies of ground water occur throughout the study area. Ground water is merely water which is found below ground level, yet in this portion of Adams and Jefferson Counties, it has been described as soft and hig in sodium bicarbonate content.[6] This water supply is to a certain degree cleansed by aquifers, or sub-surface natural filter systems some 800 feet below ground level.[7] Solid and soluable wastes deposited by industrial activity can filter through the aquifers into the ground water supply causing contamination. Should this be foreseen, industrial dumping of wastes should be located in areas removed from the ground water supply. If this is not feasible and a sanitary landfill must be located near the main water source, a treatment system may be deemed necessary. For ease of control, maintenance, and economics, one waste treatment system should be provided for the entire proposed development. It has been found that one water purification system as well as only one sewage treatment plan may be initially expensive, yet the care and maintenance can be centralized and all repair focused in one area.

A community sanitary landfill may also be located in an area removed from the main water supply or well. However, this landfill may still contaminate future water supplies through seepage of soluable materials.

Therefore, a different approach to the concept of a waste disposal system may be desired. A solution to the problems presented by a landfill might be a system devoted to the collecting, separating, and recycling of solid wastes. This system would necessitate a land area used as a collection or temporary holding station for solid wastes. From here, sorting of material types such as discarded paper goods, plastic objects, glass and breakable materials, and metal refuse, will segregate the types of solid wastes. After the sorting process, recycling of these materials can begin. A solution to the recycling process might be an industrial plant devoted to such activity within our proposed industrial development, and thereby lessen the impact of waste disposal on ground water quality.

3. Soil Erosion

Soil erosion can become detrimental to the proposed development on the site and even cause serious problems on lands adjacent to the study area. With an increase in land-forming or grading, construction of structures, and eventual wear and tear, the washing away action of soil will occur ruining soil stability on the site and causing poor water quality and heavy silting on other properties. Therefore, grading site construction work and heavy use areas should be kept to a minimum amount on soils that are relatively unstable. This presence of eroded soil will help to eliminate areas not suitable for building locations. The same factors hold true for the locating of main corridors for transportation. The appearance of potentially eroding soils will discourage a majority of streets in these soil areas, and thereby eliminate extensive sub-base preparations.

Soil erosion will also affect the quality of water, particularly the existing lake. Heavy silting caused by soil erosion would create unclear or hazy water and a dirty beach. Therefore, potential eroding soils

would not be desirable in close proximity to the existing lake and swimming beach.

4. Vegetation Stability

The stability and quality of vegetation must be insured with the Recreational, P.U.D., and Industrial development proposed for the study area. The intent of this evaluation on vegetation quality is to point out the importance of virtually no development in areas where plant materials are already vulnerable to destruction. With an increase in traffic and transportation within the study area, delicate plant materials may be trampled down and destroyed. This can result in a loss of the natural beauty of the study area. Therefore, it may be deemed necessary to reroute or relocate a system of trails and walks to guard against the destruction of valuable plant materials.

Therefore, it may be deemed necessary by the designer to either route systems of circulation to guard against the destruction of valuable plant materials or to design for the accommodation of natural plant materials. The first alternative mentioned means to relocate major and minor corridors for pedestrian and vehicular circulation. This not only saves the natural vegetation, but also creates an interesting setting for travel.

By designing to accommodate the natural vegetation the designer can save plant materials by insisting on types of construction which will not deprive the vegetation of life - supporting elements, i.e., sunlight, air, moisture, minerals, etc.

5. Visual Quality

Impact on the visual quality of the study area will be achieved by the proposed development and its

construction. The existing rural setting, indigenous vegetation, interesting landforms, meandering streams, and view areas can be turned into either a rigid, sterile environment or an environment that will integrate man and his activities with nature and its functions. The previous alternatives can determine the impact of the development on the visual quality.

Existing landforms should be taken into consideration with the siting of proposed buildings. This does not mean to determine how much cutting or filling of earth is needed; the landform consideration means to determine areas where the construction of buildings may further enhance existing landforms. These buildings, such as a proposed lodge, commercial structures, industrial office buildings, etcetera, should not hinder the visual quality of the site; they should contribute to it. These buildings may be constructed and adorned in an organic fashion with the use of native stone, rustic wood siding, and other natural materials.

Should there be a need for open field games within the recreational area, the visual quality of the study area might be noticeably changed. Such land uses as a proposed golf course will have quite a large impact on the visual qualities of the site. Long, wide expanses of green grass panels will be quite a change from the open fields or moderately forested areas presently existing on the site. Yet this type of land use can add to the character of the landforms rather than detract from it. Contrast through a juxtaposition of open fairways and wooded rough areas can improve the visual quality of the site.

The tranquility of the existing lake will lend itself very well to the visual quality of the study area. Since the lake's outer perimeter will be defined by consistent contour line, the existing elevational relief will be more defined with the appearance of water. Undisturbed lands which border this body of water will intensify the natural irregular shoreline with its inlets and projections.

The industrial park area of the development will decrease the quality of view areas on the site. Visual blockage of view areas often occurs with the existence of tall industrial complexes; therefore, building codes may be proposed for prospective manufacturers to follow.

6. Air Quality

The overall air quality of the study area will be determined by the odor of the air, the visible qualities of the air, and the presence or absence of toxic chemicals in the air. It may be noted that the study area presently rates superior in all three of these aspects of air quality, yet with an increase in human activity, this can be greatly altered. Such things as automobile transportation, unclean industry, and improperly maintained sewage lagoons can decrease the pristine qualities of air on the site.

Industry might possibly be one of the most damaging problems contributing to a low quality of air. The traditional concept of industry has been one of billowing smokestacks, toxic fumes, and widespread soot accumulation; yet, this concept can be eliminated in our development by the placing of air pollution restrictions on manufacturers. These restrictions should prohibit the presence of odors, eliminate visible dust particles, and prevent the escape of toxic fumes into the air (i.e. carbon dioxide and sulphur compounds).

An open sewage lagoon can be maintained in a manner that is not offensive in terms of odor. Through the use of a sewage treatment plant, the relatively purified liquid bi-product is collected in a lagoon for further sedimentation.

7. Shoreline Habitat

Since the majority of the water related activities in the resort area revolve around the use of the lake and in particular the proposed beach, the existence of the shoreline habitat may be seriously endangered.

With increased activity in this area, the feeding and breeding grounds of plant and animal life will be greatly decreased. The constant intervention of humans on fish and other water-dependent animals will drive the wildlife further away from the portion of the shoreline devoted to beach facilities. Picnic grounds, however, can work harmoniously with the shoreline habitat causing only moderate impact.

Still, there will be an imbalance of shoreline wildlife activity that will have noticeable impact. Therefore, there is a definite need to locate areas along the shoreline that will be conducive to wildlife refuge. This area can be located in close proximity to the undisturbed lands allowing a variance of associations between plants and animals.

8. Wildlife Habitat

The purpose of the wildlife habitat study is to evaluate areas on the site that will be conducive to the growth and development of plant and animal species. This knowledge will help to determine which areas of the study area need to be left undisturbed. It would be profitable for this location to be removed or isolated from the Industrial Park. Constant mechanical activity, absence of animal food, and excessive noises tend to discourage the presence and activity of animal life in an Industrial Park.

However, camping facilities and picnic grounds of a recreational area may be located in close proximity to the areas set aside for the development of a wildlife habitat. Other land uses within the recreational area of the proposed development can also be conducive to a wildlife habitat. Horseback riding and riding trails can either meander through the undisturbed areas or border on them. Because of this rather slow-paced recreation, wildlife activity will be reduced to a lower yet noticeable amount of impact.

A golf course can also operate in close proximity to a wildlife refuge. The land between fairways, called the rough, can radiate out from a larger portion of undisturbed land, thus integrating man, recreation, and wildlife.

The Planned Unit Development may have more impact on such a wildlife habitat because of circulation systems (streets), population, school grounds, and a commercial district. These areas with their constant brisk activity tend to "scare off" animals in their natural environment. This fact reinforces the idea of retaining undisturbed lands devoted largely to the promotion of a wildlife refuge. These undisturbed lands devoted to a wildlife refuge serve as a basis for the protection and regulation of species that are currently hunted throughout the State of Mississippi. Such species requiring regulation through our refuge are compiled in the list below:[8]

Wildlife, Fish, and Marine Life. Hunting and fishing annually draw large numbers of outdoorsmen to Mississippi. The following game are hunted in Mississippi:

1. Gray or cat squirrel and fox squirrel
2. Virginia white-tailed deer
3. Eastern cottontail rabbit and swamp rabbit
4. Eastern dove
5. Crow
6. Wild turkey
7. Bobwhite quail
8. Mallard, pintail, pigeon, and green and blue wing teal ducks
9. Fox
10. Bobcat
11. Raccoon
12. Opossum
13. Beaver
14. Geese
15. Wild hog

Nongame species existing in Mississippi include:

1. Black bear
2. Mountain lion
3. Nine-banded armadillo
4. Snakes
5. Non-game birds

Fish common in Mississippi waters are:

1. Channel catfish
2. Blue catfish
3. Flathead catfish
4. Largemouth bass
5. Blue-gill bream
6. White and black crappie

Mississippi's coastal waters provide:

1. Shrimp
2. Oysters
3. Menhaden
4. Blue crab
5. Trout
6. Crockers
7. Mullet
8. Flounder
9. Red fish

Through the evaluation of natural systems, criteria can be set for the definition and relative location of land uses and their activities. All of this data, gathered through group methods, provides the research team with a formidable base of knowledge concerning the study area. However, the information obtained can become so overwhelming that a recording and retrieving device is needed. That device is the computer.

Establishment of Computer Compatibility and Remote Sensing

Until recently maps, graphs, and tables have been the major storage and retrieval mechanisms used by Landscape Architects and other Planners. All this information was either field gathered or retrieved from various sources such as U.S.G.S. maps, USDA soil surveys, etc.

The method used in this study allows the Land Planner to apply a sophisticated method for gathering information to be used in conjunction with many of his old methods such as graphic overlays, etc. A major benefit of this method is that it allows for a fast retrieval of the information.

High altitude photography is a primary source of information in this study. Information such as existing land form character, soil character, soil moisture, surface water, forest species, forest stand density, forest height, agriculture activity, mineral and mining activity and existing land use can all be determined from high altitude photography. The scale of the imaginary (photographs) is an important consideration. The designer needs a large scale so that a lot of information can be obtained from one photograph, but there is a need for a small enough scale to be able to obtain accurate information. For this study,a scale of 1:24000 was used.

To put this information in a useable and retrievable form, the Harvard Grid System was used. This system uses a coordinate reference grid. Each grid square is designated a cell. The cells in this study are 1 hectare by 1 hectare (approximately 2.5 acres). The information accumulated previously is now related to each of the cells according to the coordinates and placed into the computer. Now we can ask the computer to locate specific cells. By asking the computer to give us only the cells which fulfill particular requirements which we have set, we can retrieve the information in a useable form. (Mapped printout). This

use of the computer has allowed us to complete in a fraction of the time what previously took many hours of graphic overlay, etc.

It should be pointed out, however, that this method does not eliminate on-site study. This should always be required of a good Land Planner. What this method does do, is locate probable sites for additional study in a fraction of the time required by conventional methods.

To effectively use the computer we must do several things that we will refer to as 'process.' These steps in the process are: identify the design variables, define our land uses, formulate attractiveness models. We select the variables we consider most important to each land use and write models in computer language from which the computer is able to give us the mapped printouts.

DESIGN VARIABLES

The variables used in our project have been established and coded into the computer for us by the Forestry Department of Mississippi State University. These variables are coded for each of the cells set up by the grid reference system (Harvard Grid System). We have chosen from the variables those which are most important to our particular land uses. Models are then coded and fed to the computer resulting in analysis sheet print outs. The outcome of this process, applying the variables to various land uses, will be models.

The variables and codes used in our project are:

1. Centroid Elevation: Centroid elevation of the cells is determined by the highest point within the cells.

   Data source: USGS maps, 15 minutes series. The readings were taken at the center of each cell and usually interpolated directly to the nearest 5'. It is recognized that maps of this type can only be

considered accurate to ± 1/2 of the contour interval.

2. Aspect: Aspect is the direction in which the average slope of the cell faces.

Data source: USGS maps, 15 minute series.

Each Grid cell was coded by the dominant slope facing within that cell. Cells that had slopes generally less than 5% overall were considered flat. The slope aspects were coded:

North	2
Northeast	3
East	4
Southeast	5
South	6
Southwest	7
West	8
Northwest	9

3. Slope Percent Class: Slope percent class is the average slope of each cell.

Data source: USGS maps, 15 minute series

The slope classifications selected for this variable are:

0 - 3	1
3 - 7	3
7 - 12	5
12 - 20	7
20 - 40	8
40+	9

The data was coded by a visual survey of the map to determine the predominant slope in the cell. The categories chosen are groups that are likely to influence decisions regarding building location, construction costs, drainage problems and possible erosion problems.

4. Topographic Position

Data source: NASA color I. R. Positive transparencies, Dec. 72 - Jan. 73

Landform character as used in this classification has an influence on land carrying capacity and activity location. It also has implications in terms of aesthetic values and probable meso-climate. (See Figure #8).

Upland ridge	1
Upland ridge, flat	2
Upland upper slope	4
Upland lower slope	5
Terrace	6
Alluvial plain	8
Swamp or marsh	9

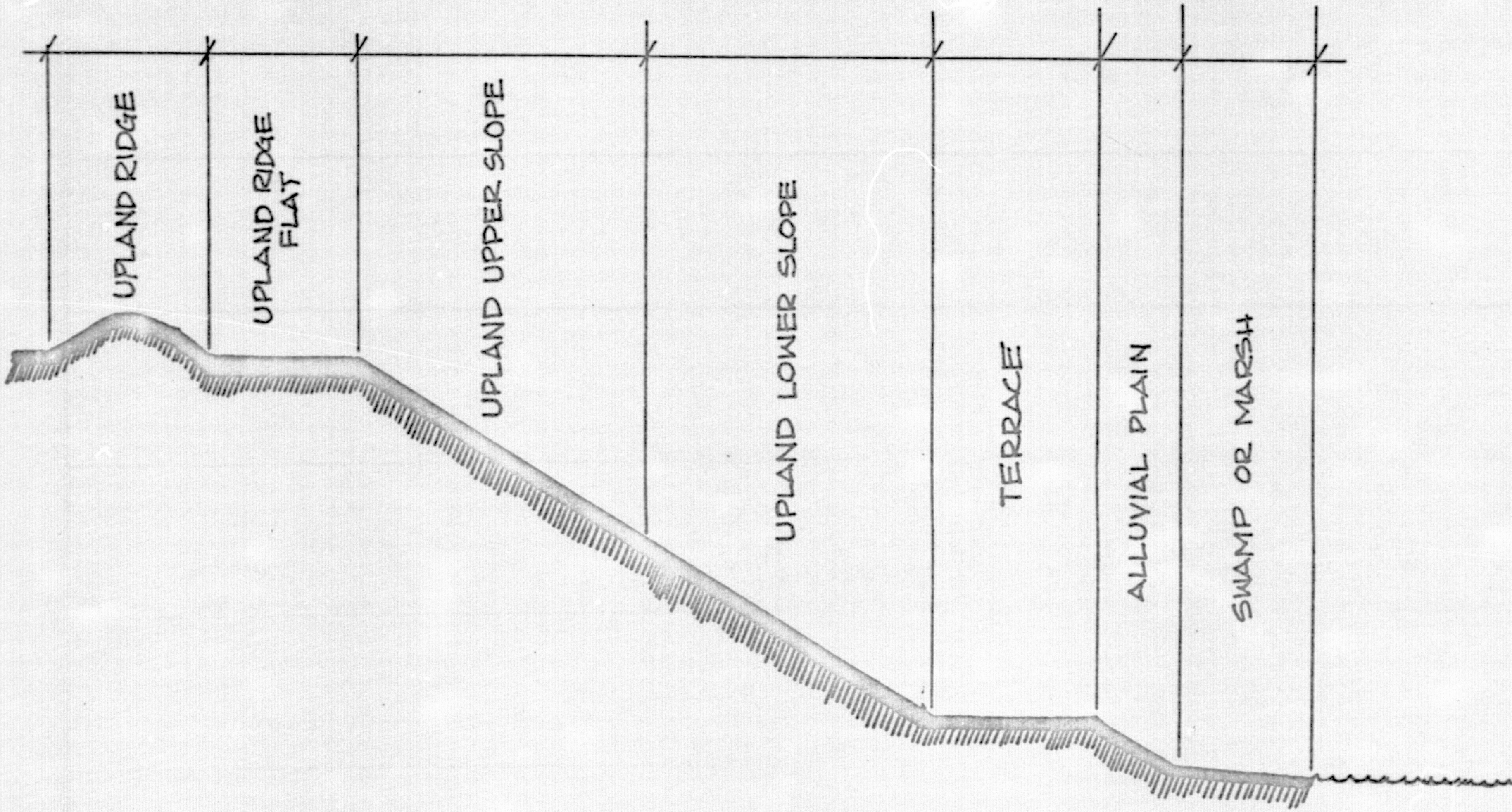
5. Soil Character: Soil character classifies the soil texture of each cell.

Data source: NASA I.R. color positive transparencies, Dec. 72 - Jan. 73.

The Natchez Area is characterized by deep loess deposits overlaying Hattiesburg and Pascagoula formations. Soils of this class have high productive capacity with minimum compaction problems. A major concern, however, is erosion protection.

Classification of soils are:

Medium texture, non-eroded	1
Medium texture, eroded	2
Fine texture, non-eroded	5
Fine texture, eroded	6
Coarse texture, non-eroded	7
Coarse texture, eroded	8
Guillied lands	9



TOPOGRAPHIC POSITION

Figure #8

6. Soil Water Regime

Data Source: NASA I.R. color positive transparencies, Dec. 72 - Jan. 73 Stereo.

Soil water regime identifies the existing drainage of each cell. It does this by telling us if the cell is well drained or poorly drained. Soil moisture was included as an indicator of possible problem areas for building location, road construction and impermeable sub-strata foundation. It is recognized that any readings taken must be suspect because there is no time frame for comparison over a period of time. The data was interpreted by careful examination of vegetation types, condition of vegetation and the dominant land form.

Soil Water Regime Classifications Are:

Moist, moderately to WD	1
Droughty, somewhat excessive	3
Wet, poorly to SPD	5
Ponded, very poorly drained	9

7. Surface Water:

Data source: NASA I.R. color positive transparencies and USGS maps, 15 minute series.

Water features are almost a necessity when attempting to locate recreational facilities. For this reason an attempt was made in the classification of water bodies to identify them in a manner that would indicate high scenic and recreation potentials. Surface water may be defined as water which is found above ground level, exposed to sunlight, air, and the surrounding environment. In the event that more than one water feature occurred in a cell, the dominant water feature processing the highest recreation value was coded.

Surface Water Classifications Are:

No water	0
3rd order stream	1
2nd order stream	2
1st order stream	4
River 150'	6
Lake (more than 10 ac.	7
Pond	9

8. Forest Stand Composition

Data source: NASA I.R. color positive transparencies - stereo

Forest Stand Classifications Are:

Pine - hardwood	1
Hardwood	3
Pine	5
Open (less than 17% cover)	7
Exceptional Tree	9

9. Forest Stand Density Class

Data source: NASA I.R. color positive transparencies - stereo

This is a measure of the tree crown density for the forested areas identified in the forest species section. The interpretation was accomplished by visual assessment and random dot screens developed by estimating relative cover as a percent of each. Assessment of the crown coverage in decidious areas was somewhat difficult since the materials used were taken prior to full leaf extension.

Forest Stand Density Class Classifications Are:

Over 75% closure	1
50 - 75% closure	3
25 - 50% closure	5
17 - 25% crown closure	7
Open (less than 17% cover)	9

10. Forest Stand Condition Class

Data source: NASA I.R. color positive transparencies - stereo

This is a classification of forest tree height and developmental stage of the forested areas. Relative height can be judged or estimated by comparing tree height with heights of known objects. The further classification gives some indication of the homogenity of the stand.

Forest stand condition class classifications are:

Open	0
Unevenaged sawtimber	1
Evenaged sawtimber	2
Unevenaged poles	4
Evenaged poles	5
Unevenaged reproduction	7
Evenaged reproduction	9

11. Agricultural Activity

Data Source: NASA I.R. color positive transparencies - stereo. Cross checked with county extension service. This variable was established to identify producing agricultural lands associated with rural farmsteads.

Agricultural Activity Classifications Are:

Non Activity	0
Groves and orchards	1
Pasture	3
Row cropping	5
Chicken operation	7
Cattle feeder operation	8
Catfish ponds	9

12. Mineral and Mining

Data source: NASA I.R. color positive transparencies and field investigation.

This category identifies extractive activities such as sand and gravel pits and petroleum fields. This is of particular significance in the Natchez-Adams County area since leakage from abandoned gas and oil wells is causing salt intrusion problems in many potable water supplies. Extractive mining activities were easily taken from the stereo media but oil wells had to be researched in the field.

Mineral and Mining Classifications Are:

None	0
Extractive, abandoned	3
Extractive	8
Oil and gas wells	9

13. Structure and Development (Existing)

Data source: NASA I.R. color positive transparencies - stereo

Residential activities were coded directly from the photographs. If multiple land use was encountered, then the dominant land use was coded. Building other than dwellings were also included in this

category. Information was coded directly from the stereo photographs after no initial familiarization with the area.

None	0
Mobile home	1
Single family	2
Multi-family	3
Cemetary	4
Institutional	5
Commercial	6
Utilities	7
Industrial	8
Sewage treatment	9

14. Within Site Transportation and Rights-of-way

Data source: NASA color positive transparencies and USGS maps, 15 min. series

Initial classification of roads and other transportation facilities was done using USGS maps. Then this information was revised using the photographic materials. In the event that more than one transportation type occurred in one cell, the major road or presence of any road was given preference over other transportation types.

Within Site Transportation and Rights-of-way Classifications Are:

None	0
Abandoned logging or woods	1
Logging or woods road	2
Improved dirt	3
2-lane unimproved	4
2-lane improved	5
2-lane paved	6
4-lane	7
Railroad	8

15. Righis of Way

None	0
Gas or oil pipelines	1
REA lines	3
Transmission lines	5

16. Location of Existing Lake

Cell outside proposed lake	0
Within cell at 260 feet level	1
Within cell at 280 feet level	5

17. Centroid Elevation - Coded

Less than 265 feet	0
265 - 284 feet	1
285 - 294 feet	2
295 - 304 feet	3
305 - 314 feet	4
315 - 324 feet	5
325 - 344 feet	6
345 - 364 feet	7
365 - 394 feet	8
395 - feet or greater	9

18. Existing Activity

No activity	0
Agricultural Activity Only	1
Other Activity*	2

(*Note: Other activity consists of minerals and mining, structures and development excluding mobile homes, paved roads and railroads, and utility right-of-ways).

SEARCH VARIABLES

Search variables are used to locate cells a specified distance from previously identified land uses. A cell, 100 meters by 100 meters, is used for measurements.

19. Proximity to Existing Lake

Data source: US Department of Agriculture, Soil Conservative Service.

Lake in cell	0
Lake within 1 cell	1
Lake within 2 cells	2
Lake within 3 cells	3
Lake within 4 cells	4
Lake within 5 cells	5
Lake within 6 cells	6
Lake within 7 cells	7
Lake within 8 cells	8
Lake within 9 cells or more away	9

20. Proximity to Minerals and Mining

M & M in cell	0
M & M within 1 cell	1
M & M within 2 cells	2
M & M within 3 cells	3
M & M within 4 cells	4
M & M within 5 cells	5
M & M within 6 cells	6
M & M within 7 cells	7
M & M within 8 cells	8
M & M within 9 cells or more away	9

21. Proximity to Unimproved Roads

Road to cell	0
Road within 1 cell	1
Road within 2 cells	2
Road within 3 cells	3
Road within 4 cells	4
Road within 5 cells	5
Road within 6 cells	6
Road within 7 cells	7
Road within 8 cells	8
Road 9 cells or more away	9

(Note: Unimproved roads includes logging roads, and improved dirt roads)

22. Proximity to Unpaved 2-lane Roads

Road in cell	0
Road within 1 cell	1
Road within 2 cells	2
Road within 3 cells	3
Road within 4 cells	4
Road within 5 cells	5
Road within 6 cells	6
Road within 7 cells	7
Road within 8 cells	8
Road 9 cells or more away	9

23. Proximity to Right-of-ways

Data source: Gridded USGS map, corrected from NASA transparencies

This variable recorded the proximity of individual cells to R.O.W. of paved or unpaved roads. Measurements are given as distances in cells, each cell representing 200 meters horizontal measure for each cell.

Proximity to Right-of-way Classifications Are:

ROW in cell	0
ROW within 1 cell	1
ROW within 2 cells	2
ROW within 3 cells	3
ROW within 4 cells	4
ROW within 5 cells	5
ROW within 6 cells	6
ROW within 7 cells	7
ROW within 8 cells	8
ROW 9 cells or more away	9

24. Proximity to Agricultural Activity

Activity in cell	0
Activity in 1 cell	1
Activity in 2 cells	2
Activity in 3 cells	3
Activity in 4 cells	4
Activity in 5 cells	5
Activity in 6 cells	6
Activity in 7 cells	7
Activity in 8 cells	8
Activity 9 cells or more away	9

25. Proximity to Structures and Development*

S & D in cell	0
S & D in 1 cell	1
S & D in 2 cells	2
S & D in 3 cells	3
S & D in 4 cells	4
S & D in 5 cells	5
S & D in 6 cells	6
S & D in 7 cells	7
S & D in 8 cells	8
S & D in 9 cells or more away	9

(*Note: Excludes mobile homes)

26. Proximity to Existing Activity*

Activity in cell	0
Activity within 1 cell	1
Activity within 2 cells	2
Activity within 3 cells	3
Activity within 4 cells	4
Activity within 5 cells	5
Activity within 6 cells	6
Activity within 7 cells	7
Activity within 8 cells	8
Activity within 9 cells or more	9

(*Note: Existing activity includes agricultural activity, minerals and mining, structures and development except mobile homes, paved roads and railroads, and utility right-of-ways).

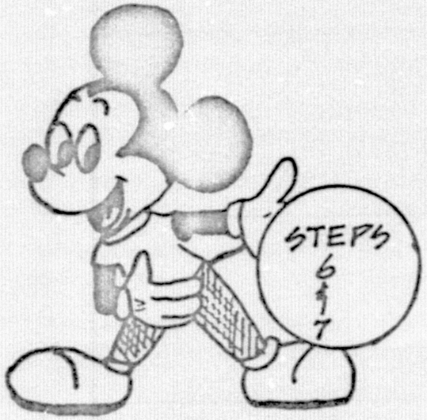
27. Proximity to Streams

1st or 2nd order stream in cell	0
1st or 2nd order stream with 1 cell	1
1st or 2nd order stream with 2 cells	2
1st or 2nd order stream with 3 cells	3
1st or 2nd order stream with 4 cells	4
1st or 2nd order stream with 5 cells	5
1st or 2nd order stream with 6 cells	6
1st or 2nd order stream with 7 cells	7
1st or 2nd order stream with 8 cells	8
Stream more than 9 cells away	9

28. Proximity to within Site Transportation

Within cell	0
Within 1 cell	1
Within 2 cells	2
Within 3 cells	3
Within 4 cells	4
Within 5 cells	5
Within 6 cells	6

Within 7 cells	7
Within 8 cells	8
9 Cells or more away	9



LAND USE DEFINITIONS

Our group has identified land uses to which variables will be applied. These land uses are Residential (PUD), Industrial and Recreational. Within these three major land uses are smaller units which have requirements that are particular to that land use. These land uses are, lodge, marina, trailer camping and sewage treatment/sanitary landfill. Our group has researched the criteria for each of these land uses relative to our design goals and objectives, which have previously been stated. This research is reflected in the land use definitions.

We feel that the residential area or planned unit development should furnish the residents with a total environment. To accomplish this total environment the PUD must offer such things as a school, commercial district, library, playgrounds and parks, a water system, sewage system, garbage collection and street system. An important factor to remember is that the PUD should be structured around the individual home. Certain requirements should be used to enforce and insure a high quality of life within the PUD. These requirements should deal with the quality of industry and commerical developments in and around the PUD. The PUD must also relate to the other proposed land uses (recreation and industry) to enable the site to function as a complete unit.

Important existing factors to consider in relation to the residential area are: forest type, forest development stage, forest density, forest condition, topography, topographic aspect, proximity to existing

lake, proximity to existing transportation, surface water, soil water, soil character, existing landforms and existing land uses, i.e. mining, agriculture. We feel that to accomplish maximum development of the site, consideration of particular aspects of existing conditions is important in the creation of an environmentally sound plan of development. These considerations allow us to reduce the amount of impact incurred to the site.

We feel the recreational area should serve the area as a resort complex and serve not only as a community facility but as a tourist attraction for the entire area. In order to serve as a resort complex we have identified several facilities within the area of recreational land use. These facilities are a marina, a lodge, a golf course, horseback riding, a trailer campground, a primitive area for tent camping and undisturbed land. These areas will not only serve as tourist oriented activities, but activities that will encourage families to participate from within the site and from the surrounding area.

Important factors to consider in relation to the recreational area are: topography, topographic aspect, proximity to existing lake, soil character, soil water, surface and vegetation.

The industrial park should provide residents of the PUD with a working environment near their home. This working environment should be a healthy one, free of any industry which may provide a possibility of causing pollution. The industrial park should provide space for light industry. Hopefully these industries could provide job opportunities for the area's unskilled laborers.

Important factors to consider in relation to the industrial park are: proximity to transportation, soil class, soil water, topography, topographic aspect and existing activities.

The lodge should be a place for residents and tourist to enjoy the resources available on the site. The lodge should provide adaquate accomodations for the overnight visitors to the area. Dining facilities should take into consideration not only the tourist but should also accommodate area residents. The lodge should serve as a center for all recreational and community activities.

Important factors to consider in locating the lodge and slope, type soil, vegetation, density of vegetation, centroid elevation, availability of existing roads.

The marina should provide not only a docking complex for boats but should also provide service for the boats and users of the marina. There should be a maintenance area for boats. This area would also serve as a place for refueling, rental and public launching facilities. The marina should also provide limited facilities for its users. These might include limited restaurant and bar facilities, a small dining room, a marine store and a locker room/dressing room. The marina should serve as the center for all water related activities.

Important factors to consider in locating the marina are slope, proximity to the lake, availability of existing transportation, existing vegetation and the density of the vegetation.

Natchez is a major tourist area in our state. We feel that balance should be maintained in the type facility available to the tourist. The lodge which offers rooms, tent camping areas which allow for primitive camping and a trailer camping facility to provide for the mobile camping family. The trailer camping facility should provide up to date facilities such as water and electric hookups, showers, sewage dump facilities for their portable bathrooms, and permanent restroom facilities. The trailer camping facility should be located near a major highway and historical site.

Important factors to consider in the location of the trailer camping complex are proximity to existing transportation, proximity to historical sites, slope, surface water, vegetation, vegetation density, proximity to existing utilities, soil water, soil character and existing landforms.

The sewage treatment/sanitary landfill should be located in such a manner so as to provide easy access to and from each land use. Both of these land uses have the capability for impact upon the site. It is necessary to insure that these developments be environmentally sound no matter what method is eventually used for disposal. Landfills should be used for the reinforcement of existing landforms rather than covering them up. Sewage treatment facilities should not interfere with the air or water quality of the site in any way. It should also have a pleasing appearance. Recycling should also be considered a real possibility for both the garbage and sewage. Both of these complexes should be capable of supporting the expansion its facilities due to an increased load.

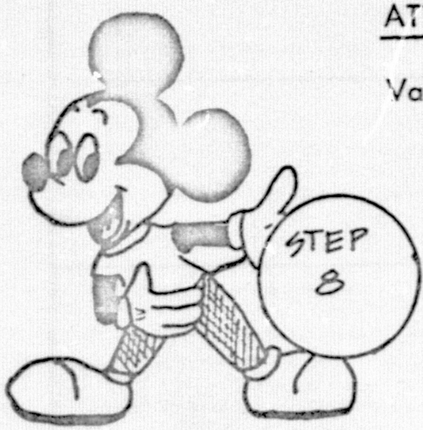
Important factors to consider in locating the sewage treatment/sanitary landfill are soil type, soil character, surface water, existing landforms, vegetation, proximity to transportation and proximity to other activities.

Having defined our land uses and previously identified our variables we can now proceed to the model development. The first stage of model development is establishing attractiveness models.

The attractiveness models are our expression of the most desired situations for each land use. We have chosen the variables we consider important to each land use and selected the sub-variable (breakdown of each variable) we consider most important. Using the Residential land use for an example, we can say that

slope is important and 3% to 7% slope is most desireable. We have identified a minimum of 10 variables for each land use. This list of variables along with appropriate sub-variables make up the attractiveness models.

ATTRACTIVENESS MODELS



Variables to be used in the site selection of the residential area are:

Topographic aspect - South, Southeast, Southwest

Slope Percent Class - 3% to 7%

Topographic position - upland ridge, upland upper slope

Soil character - Medium non eroded

Soil water regime - moist, well drained

Surface water - lakes

Forest stand composition - mixed pine and hardwood

Forest stand density - 25% to 50%

Agricultural activity - none

Mineral and mining activity - none

Variables to be used in the site selection of recreational area are:

Topographic aspect - South, Southeast, Southwest

Slope percent class - 3% to 7%

Topographic position - upland ridge, upland upper slope

Soil character - medium, non eroded

Soil water regime - moist, well drained

Surface water - lakes, streams

Forest stand composition - mixed pine and hardwood

Forest stand density class - 50% - 75% cover

Mining and mineral activity - none

Proximity to proposed lake - within 8 cells

Variables to be used in the site selection of the industrial park are:

Slope percent class - 3% to 7%

Topographic position - Upland ridge, upland upper slope

Soil character - Medium non eroded

Soil water regime - moist, well drained

Surface water - none

Forest stand density - open to 17% cover

Agricultural activity - none

Minerals and mining - none

Proximity to existing R.O.W. - within 8 cells

Variables to be used in the site selection of the lodge are:

Centroid elevation - coded - 305 feet to 314 feet

Topographic aspect - South, Southeast, Southwest

Slope percent class - 3% to 7%

Topographic position - upland ridge, upland upper slope

Soil character - medium non eroded

Soil water regime - moist well drained

Surface Water - First order streams

Forest stand composition - mixed pine and hardwood

Forest stand density class - 25% to 75% cover

Proximity to proposed lake - within 8 cells

Variables to be used in the site selection of the marina are:

Aspect - South, Southeast, Southwest

Slope percent classes - 7% to 12%

Topographic position - upland ridge

Soil character - medium non eroded

Soil water regime - water

Forest stand composition - mixed pine and hardwood

Forest stand density class - 25% to 50% cover

Mineral and mining - none

Proximity to existing R.O.W. - Within 8 cells

Proximity to proposed lake - lake in cell

Variables to be used in the site selection of the trailer camping facilities are:

Slope percent class - 2% to 5%

Topographic position - upland ridge, upland upper slope, upland lower slope

Soil character - medium non eroded

Soil water regime - moist, well drained

Surface water - any is good

Forest stand composition - mixed pine and hardwood

Forest stand density class - 50% - 75% cover

Minerals and mining - none

Proximity to right-of-ways within 8 cells

Variables to be used in the site selection of the sewage treatment/sanitary landfill are:

Aspect - North, Northeast, Northwest

Slope percent class - 5% - 8%

Topographic position - upland lower slope

Soil character - fine eroded

Soil water regime - moist well drained to droughty

Surface water - none

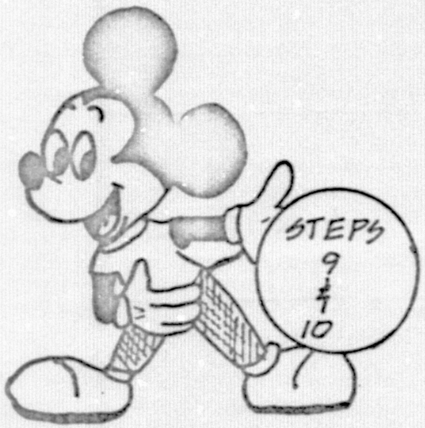
Forest stand density class - open less than 17% cover

Mineral and mining - none

Proximity to unpaved 2-lane roads - within 8 cells

Proximity to existing activity - activity within 9 cells or more

DESIGN MODELS



To create design models is a relatively simple exercise now that we have identified the variables, defined our land uses and selected the variables for each land use.

To demonstrate model building we will use an illustration (See figure 9). First, the land use model must be identified. For the model, this identification is called the attractiveness index name. Directly under that you let the programmer know how many variables are to be used. To identify the variables, the number corresponding to the desired variable is placed in the column headed "Variable number." For the example, we will use the variable slope percent class and the number 3 is entered. To let the computer know what slopes we prefer, we locate the desired slope on the variable charts and its code. For instance, if we want the slope of 7% to 12%, we see that it is coded 5. We will also note the 3% to 7%, code 3, is acceptable as is 12% to 20%, code 7. What we need to let the computer know now is our preference of these slopes. To do this, we rate each slope from 0 to 9, 9 being the most suitable. So under each code, we place our rating of that slope. We rate 7% to 12%, code 5 the primary choice with a rating of 9, 3% to 7%, code 3 our secondary choice with a code 8, and 12% to 20%, code 7, our last choice by giving it a rating of 7.

If all of the slopes happened to be equally acceptable, the same value could have been placed on them and they would have all been considered equally by the computer.

If the list of variables is long, you will see that some variables are more important than others. Realizing this, you want the computer to consider those variables first. The model allows you to consider the more important variables first by placing weighted values on each variable. The weighted value, between 1, the lowest, and 2 the highest, were set by us according to what variables we considered most important. It is possible to weigh several variables the same if they are considered of equal importance.

Names ______________________

____

____

ATTRACTIVENESS INDEX NAME ______________________ (20 characters maximum)

NUMBER OF VARIABLES 1

Variable #	0	1	2	3	4	5	6	7	8	9	Weight
3	Ø	Ø	Ø	8	Ø	9	Ø	7	Ø	Ø	2.0

To reject a cell on a specified condition:

List the variable # and abbreviated title

Set the values for rejection to "0"; the rest to scale 0-9

Set the weight to 1.0 - 2.0

Figure #9

Names Alpha Group

ATTRACTIVENESS INDEX NAME Residential (20 Characters Maximum)
NUMBER OF VARIABLES 10

Variable #	0	1	2	3	4	5	6	7	8	9	Weight
2	Ø	Ø	1	2	3	9	9	9	5	1	1.8
3	Ø	7	Ø	9	Ø	8	Ø	Ø	Ø	Ø	1.8
4	Ø	9	8	Ø	9	8	7	Ø	Ø	Ø	1.7
5	Ø	9	7	Ø	Ø	5	4	8	7	Ø	1.2
6	Ø	9	Ø	5	Ø	5	Ø	Ø	Ø	Ø	1.7
8	Ø	9	Ø	8	Ø	8	Ø	3	Ø	5	1.8
9	Ø	5	Ø	9	Ø	9	Ø	3	Ø	5	1.8
10	5	9	8	Ø	7	6	Ø	2	Ø	1	1.8
19	1	9	8	7	6	5	4	3	2	1	1.0
20	1	1	2	3	4	5	6	7	8	9	1.8

To reject a cell on a specified condition

List the variable # and abbreviated title

Set the values for rejection to "0" the rest to scale 0 - 9

Set the weight to 1.0 - 2.0

Names Alpha Group

ATTRACTIVENESS INDEX NAME Recreational (20 Characters Maximum)
NUMBER OF VARIABLES 10

Variable #	0	1	2	3	4	5	6	7	8	9	Weight
2	Ø	Ø	3	4	4	9	9	9	4	4	1.5
3	Ø	8	Ø	9	Ø	7	Ø	3	2	Ø	1.8
4	Ø	9	9	Ø	9	7	4	Ø	3	Ø	1.8
5	Ø	9	7	Ø	Ø	6	2	8	7	Ø	1.6
6	Ø	9	Ø	6	Ø	3	Ø	Ø	Ø	1	1.2
8	Ø	9	Ø	7	Ø	7	Ø	6	Ø	5	1.5
9	Ø	7	Ø	9	Ø	7	Ø	5	Ø	5	1.5
10	5	9	8	Ø	7	6	Ø	2	Ø	1	1.5
19	8	9	8	7	6	5	4	3	2	1	1.8
20	1	1	2	3	4	5	6	7	8	9	1.8

To reject a cell on a specified condition

List the variable # and abbreviated title

Set the values for rejection to "0" the rest to scale 0 - 9

Set the weight to 1.0 - 2.0

Names Alpha Group

ATTRACTIVENESS INDEX NAME Industrial (20 Characters Maximum)
NUMBER OF VARIABLES 9

Variable #	0	1	2	3	4	5	6	7	8	9	Weight
3	Ø	7	Ø	9	Ø	7	Ø	Ø	Ø	Ø	1.8
4	Ø	9	9	Ø	9	7	6	Ø	Ø	Ø	1.8
5	Ø	9	4	Ø	Ø	8	4	5	1	Ø	1.6
6	Ø	9	7	Ø	Ø	3	Ø	Ø	Ø	1	1.4
7	9	7	5	Ø	2	Ø	Ø	Ø	Ø	Ø	1.5
8	Ø	5	Ø	5	Ø	5	Ø	9	Ø	Ø	1.2
9	Ø	1	Ø	2	Ø	3	Ø	5	Ø	9	1.0
12	9	Ø	Ø	5	Ø	Ø	Ø	Ø	5	5	1.1
24	1	2	3	4	5	6	7	8	9	9	1.5

To reject a cell on a specified condition

List the variable # and abbreviated title

Set the values for rejection to "0" the rest to scale 0 - 9

Set the weight to 1.0 - 2.0

c-2

Names Alpha Group

ATTRACTIVENESS INDEX NAME Lodge (20 Characters Maximum)
NUMBER OF VARIABLES 9

Variable #	0	1	2	3	4	5	6	7	8	9	Weight
2	Ø	Ø	1	2	3	9	9	9	5	1	1.9
3	Ø	7	Ø	9	Ø	7	Ø	Ø	Ø	Ø	1.9
5	Ø	9	7	Ø	Ø	7	5	8	6	2	1.5
6	Ø	9	Ø	5	Ø	2	Ø	Ø	Ø	Ø	1.8
8	Ø	9	Ø	8	Ø	8	Ø	5	Ø	3	1.5
9	Ø	9	Ø	9	Ø	8	Ø	7	Ø	3	1.7
10	5	9	8	Ø	7	6	Ø	2	Ø	1	1.7
17	Ø	Ø	3	7	9	8	4	2	Ø	Ø	1.5
19	5	7	8	9	7	6	5	4	3	2	1.2

To reject a cell on a specified condition

List the variable # and abbreviated title

Set the values for rejection to "0" the rest to scale 0 - 9

Set the weight to 1.0 - 2.0

Names Alpha Group

ATTRACTIVENESS INDEX NAME Marina (20 Characters Maximum)

NUMBER OF VARIABLES 10

Variable #	0	1	2	3	4	5	6	7	8	9	Weight
2	Ø	Ø	1	2	3	9	9	9	5	1	1.9
3	Ø	2	Ø	8	Ø	9	Ø	7	Ø	Ø	1.9
5	Ø	9	5	Ø	Ø	7	3	9	5	1	1.0
8	Ø	9	Ø	8	Ø	8	Ø	3	Ø	5	1.7
9	Ø	7	Ø	8	Ø	9	Ø	6	Ø	3	1.5
10	5	9	8	Ø	7	6	Ø	2	Ø	1	1.7
17	Ø	9	3	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1.9
19	9	5	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1.9
20	1	1	2	3	4	5	6	7	8	9	1.9
22	1	7	8	9	6	5	4	3	2	1	1.5

To reject a cell on a specified condition

List the variable # and abbreviated title

Set the values for rejection to "0" the rest to scale 0 - 9

Set the weight to 1.0 - 2.0

Names Alpha Group

ATTRACTIVENESS INDEX NAME Trailer Camping (20 Characters Maximum)
NUMBER OF VARIABLES 9

Variable #	0	1	2	3	4	5	6	7	8	9	Weight
2	Ø	Ø	1	2	3	9	9	9	5	1	1.8
3	Ø	7	Ø	9	Ø	5	Ø	Ø	Ø	Ø	1.8
4	Ø	9	9	Ø	9	9	7	Ø	Ø	Ø	1.8
5	Ø	9	5	Ø	Ø	8	4	8	4	1	1.5
6	Ø	9	Ø	7	Ø	3	Ø	Ø	Ø	1	1.5
7	4	8	8	Ø	9	Ø	8	8	Ø	8	1.1
8	Ø	9	Ø	8	Ø	8	Ø	3	Ø	5	1.5
9	Ø	7	Ø	9	Ø	7	Ø	5	Ø	3	1.5
10	5	9	8	Ø	7	6	Ø	2	Ø	1	1.5

To reject a cell on a specified condition

List the variable # and abbreviated title

Set the values for rejection to "0" the rest to scale 0 - 9

Set the weight to 1.0 - 2.0

Names Alpha Group

Clopton, Funderburk

Jackson, Lavender

ATTRACTIVENESS INDEX NAME Sewage/Sanitary (20 Characters Maximum)
NUMBER OF VARIABLES 10

Variable #	0	1	2	3	4	5	6	7	8	9	Weight
2	Ø	Ø	9	9	7	2	1	1	1	9	1.9
3	Ø	3	Ø	9	Ø	8	Ø	7	5	1	1.7
4	Ø	7	7	Ø	7	9	7	Ø	Ø	Ø	1.5
5	Ø	5	6	Ø	Ø	8	9	2	4	7	1.8
6	Ø	9	Ø	9	Ø	1	Ø	Ø	Ø	Ø	1.7
7	9	7	3	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1.3
9	Ø	1	Ø	3	Ø	5	Ø	7	Ø	9	1.0
20	6	7	8	9	8	7	6	5	4	3	1.2
21	5	6	7	9	8	7	6	5	4	3	1.7
26	1	2	3	3	4	5	6	7	8	9	1.4

To reject a cell on a specified condition

List the variable # and abbreviated title

Set the values for rejection to "0" the rest to scale 0 - 9

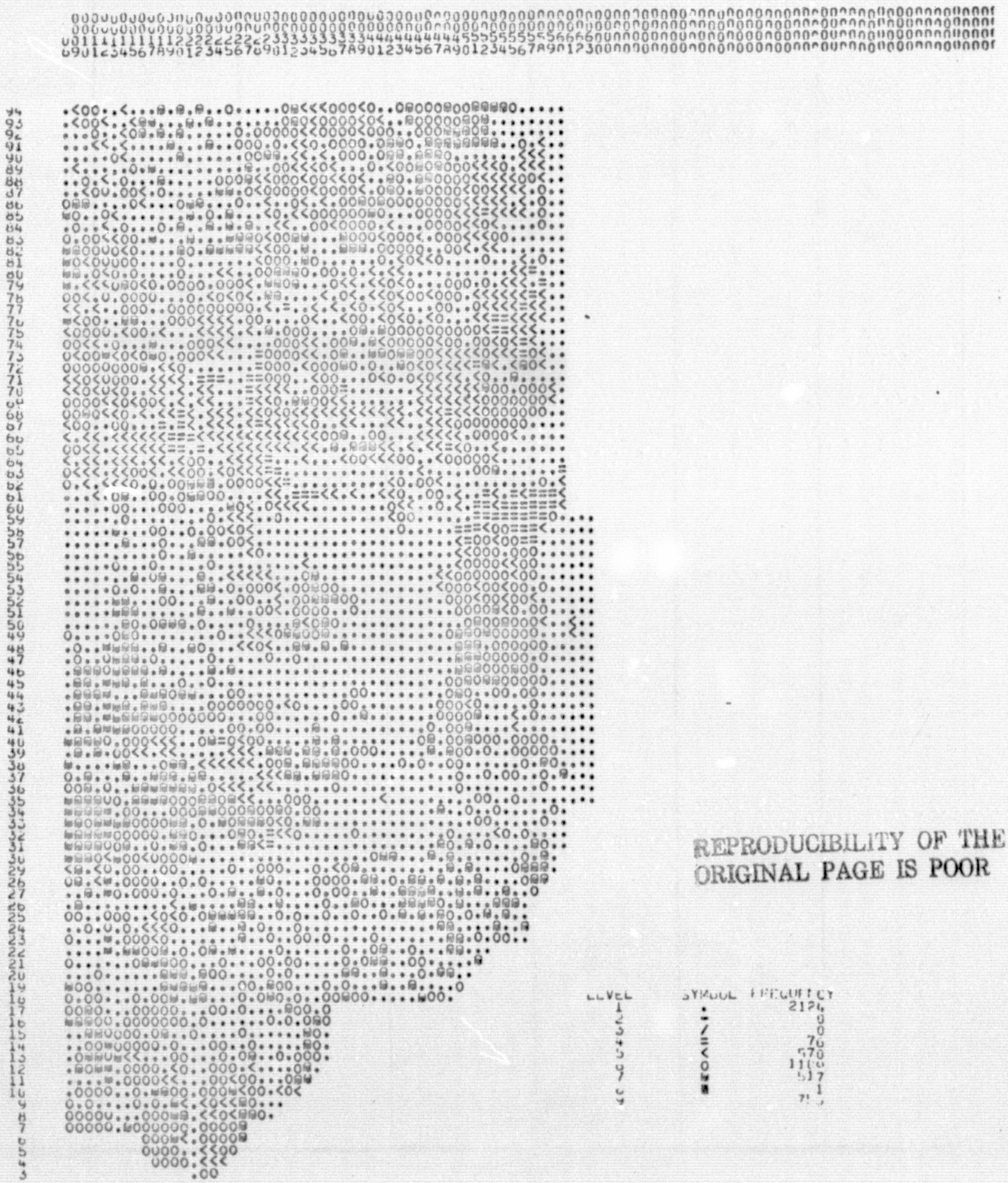
Set the weight to 1.0 - 2.0

Each of the preceeding models were fed to the computer and the following maps were generated. These computer maps locate cells and rank them relative to the design models. On the maps 8 is the best level, 1 the poorest. Each level is identified by a graphic symbol. The computer maps also give us the frequency of occurrence for each graphic symbol. From this we can identify the amount of acreage at each level.

SUITABILITY INDEX NAME: RESIDENTIAL   STUDY: ALPHA GROUP

NO.	VARIABLE NAME	0	1	2	3	4	5	6	7	8	9	WGT	PROPORTION
2	ASPECT	0	0	1	2	3	9	9	9	5	1	1.80	.11
3	SLOPE PERCENT CLASS	0	7	0	9	0	8	0	0	0	0	1.80	.11
4	TOPOGRAPHIC POSITION	0	9	8	0	9	8	7	0	0	0	1.70	.10
5	SOIL CHARACTER	0	9	7	0	0	5	4	8	7	0	1.20	.07
6	SOIL WATER REGIME	0	9	0	5	0	5	9	0	0	0	1.70	.10
8	FOREST STAND COMPOSITION	0	9	0	8	0	8	6	3	0	5	1.80	.11
9	FOREST STAND DENSITY CLASS	0	5	0	9	0	9	0	3	0	5	1.80	.11
10	FOREST STAND CONDITION CLASS	5	9	8	0	7	6	0	2	0	1	1.80	.11
19	PROXIMITY TO PROPOSED LAKE(260)	1	9	8	7	6	5	4	3	2	1	1.00	.06
20	PROXIMITY TO MINERALS&MINING	1	1	2	3	4	5	6	7	8	9	1.80	.11

NW CORNER COORDINATES=   3, 94



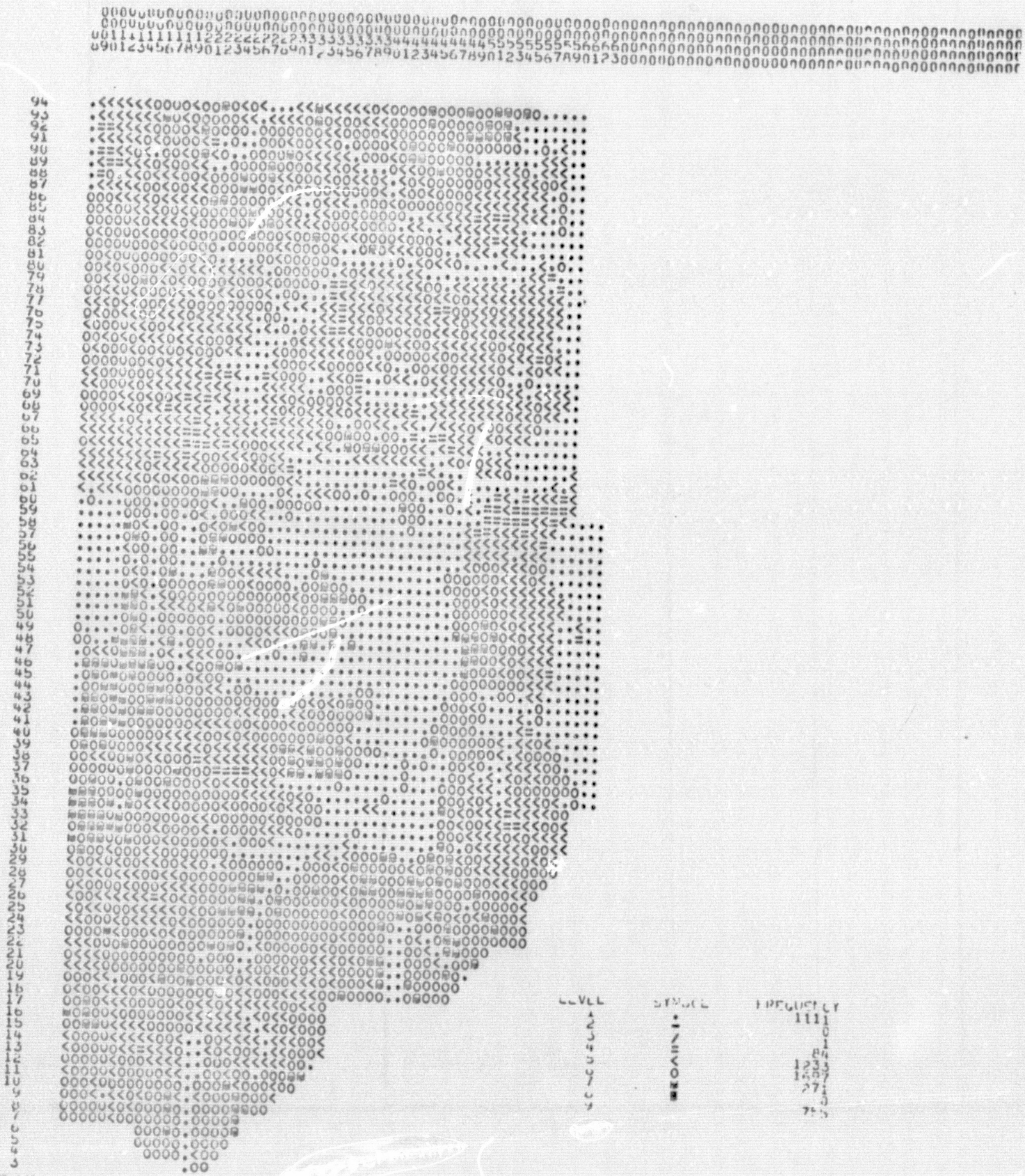
LEVEL	SYMBOL	FREQUENCY
1	.	2124
2	-	0
3	/	0
4	=	76
5	<	570
6	O	1109
7	■	517
8	■	1
9		7[illegible]

SUITABILITY INDEX NAME: RECREATIONAL

STUDY: ALPHA GROUP

NO.	VARIABLE NAME	0	1	2	3	4	5	6	7	8	9	WGT	PROPORTION
2	ASPECT	0	0	3	4	4	9	9	9	4	4	1.50	.09
3	SLOPE PERCENT CLASS	0	8	0	9	0	7	0	3	2	0	1.80	.11
4	TOPOGRAPHIC POSITION	0	9	9	0	9	7	4	0	3	0	1.80	.11
5	SOIL CHARACTER	0	9	7	0	0	6	2	8	7	0	1.60	.10
6	SOIL WATER REGIME	0	9	0	6	0	3	0	0	0	1	1.20	.08
8	FOREST STAND COMPOSITION	0	9	0	7	0	7	0	6	0	5	1.50	.09
9	FOREST STAND DENSITY CLASS	0	7	0	9	0	7	0	5	0	5	1.50	.09
10	FOREST STAND CONDITION CLASS	5	9	8	0	7	6	0	2	0	1	1.50	.09
19	PROXIMITY TO PROPOSED LAKE(260)	8	9	8	7	6	5	4	3	2	1	1.80	.11
20	PROXIMITY TO MINERALS MINING	1	1	2	3	4	5	6	7	8	9	1.80	.11

NW CORNER COORDINATES= 8, 94



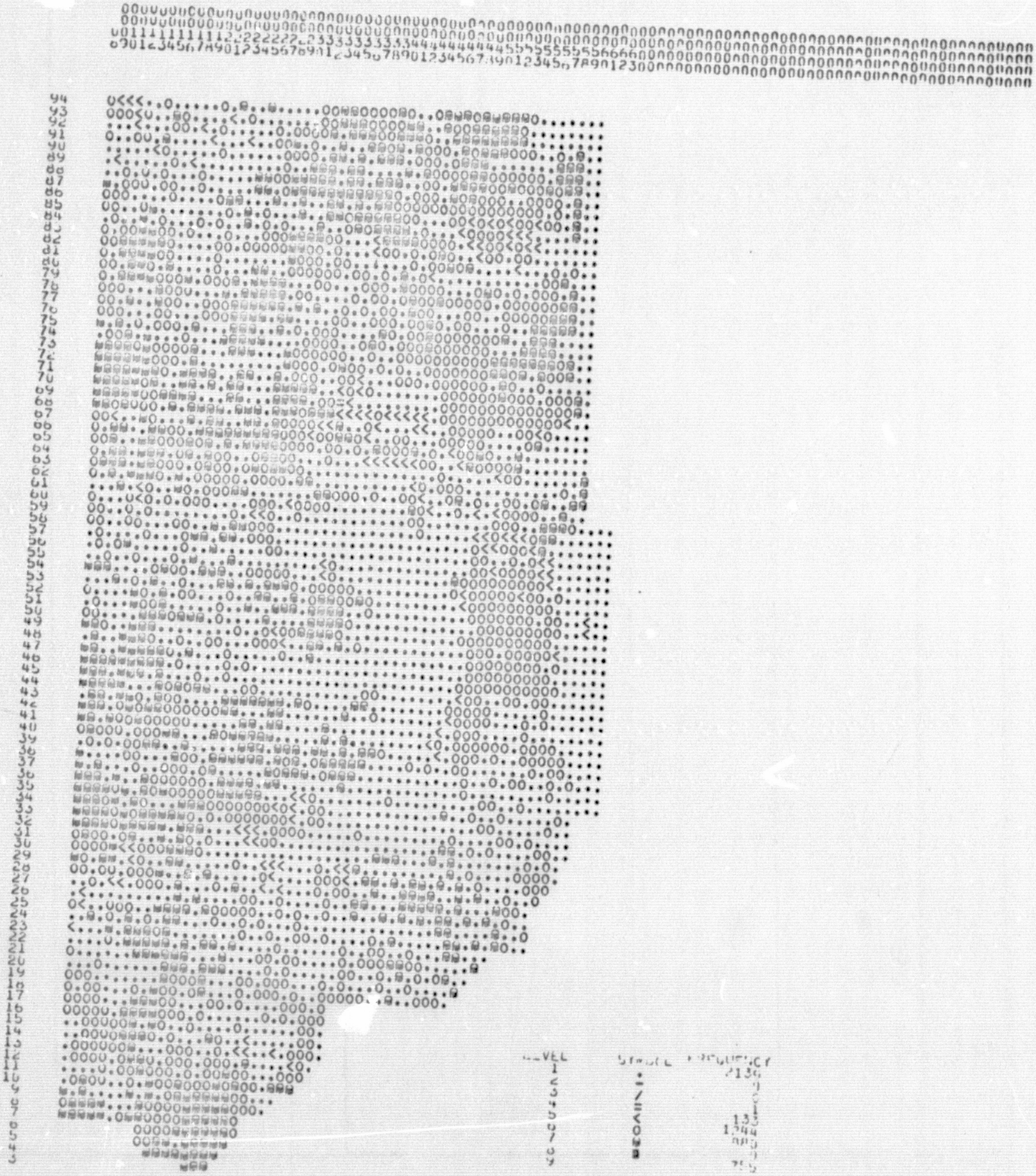
LEVEL	SYMBOL	FREQUENCY
1	.	1111
2	-	0
3	/	1
4	=	84
5	<	1233
6	O	1507
7	■	271
8	■	0
9	[illegible]	755

SUITABILITY INDEX NAME: INDUSTRIAL

STUDY: ALPHA GROUP

NO.	VARIABLE NAME	0	1	2	3	4	5	6	7	8	9	WGT	PROPORTION
3	SLOPE PERCENT CLASS	0	7	0	9	0	7	0	0	0	0	1.80	.14
4	TOPOGRAPHIC POSITION	2	9	9	0	9	7	6	0	0	0	1.80	.14
5	SOIL CHARACTER	0	9	4	0	0	8	4	0	0	0	1.60	.12
6	SOIL WATER REGIME	0	9	7	0	0	3	0	5	1	0	1.40	.11
7	SURFACE WATER	0	7	5	0	2	0	0	0	0	1	1.50	.12
8	FOREST STAND COMPOSITION	0	5	0	5	0	5	0	0	0	0	1.20	.09
9	FOREST STAND DENSITY CLASS	0	1	0	2	0	3	0	9	0	0	1.00	.08
12	MINERALS AND MINING	0	0	0	5	0	0	0	5	0	9	1.10	.09
24	PROXIMITY TO AGRICULTURAL ACTIVITY	1	2	3	4	5	6	7	8	9	9	1.50	.12

NW CORNER COORDINATES= 8, 94

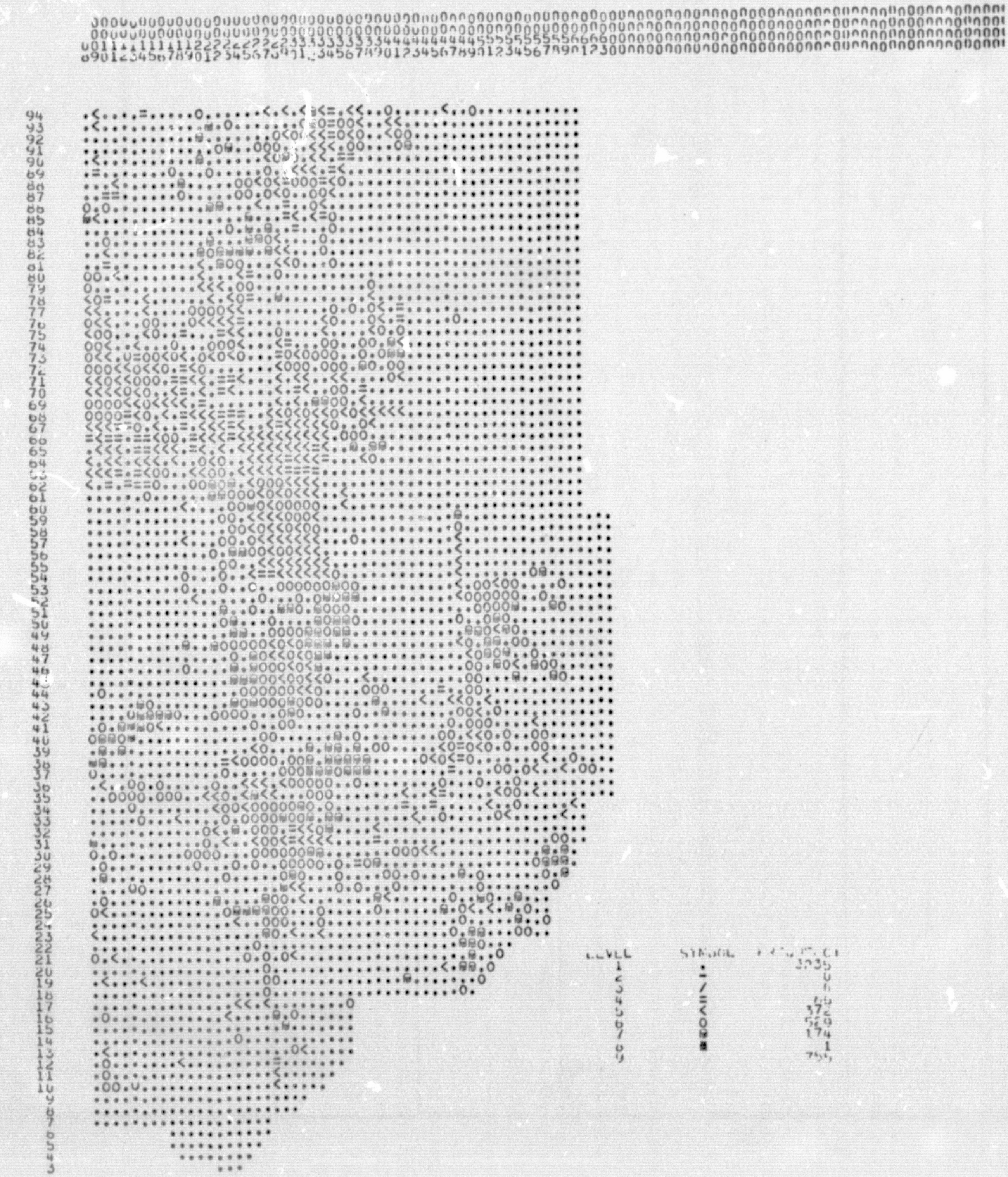


LEVEL	SYMBOL	FREQUENCY
1	.	2136
2	-	[illegible]
3	/	[illegible]
4	=	[illegible]
5	<	133
6	0	1344
7	O	889
8	■	[illegible]
9	■	759

SUITABILITY INDEX NAME: LODGE STUDY: ALPHA GROUP

NO.	VARIABLE NAME	0	1	2	3	4	5	6	7	8	9	WGT	PROPORTION
2	ASPECT	0	0	1	2	3	9	9	9	5	1	1.90	.13
3	SLOPE PERCENT CLASS	0	7	0	9	0	7	0	0	0	0	1.90	.13
5	SOIL CHARACTER	9	9	7	0	0	7	5	8	6	2	1.50	.10
6	SOIL WATER REGIME	0	9	0	5	0	2	0	0	0	0	1.80	.12
8	FOREST STAND COMPOSITION	0	9	0	8	0	8	0	5	0	3	1.50	.10
9	FOREST STAND DENSITY CLASS	0	9	0	9	0	8	0	7	0	3	1.70	.12
10	FOREST STAND CONDITION CLASS	5	9	8	0	7	6	0	2	0	1	1.70	.12
17	CENTROID ELEVATION-CODED	0	0	3	7	9	8	4	2	0	0	1.50	.10
19	PROXIMITY TO PROPOSED LAKE (200)	5	7	8	9	7	6	5	4	3	2	1.20	.08

NW CORNER COORDINATES= 8, 94



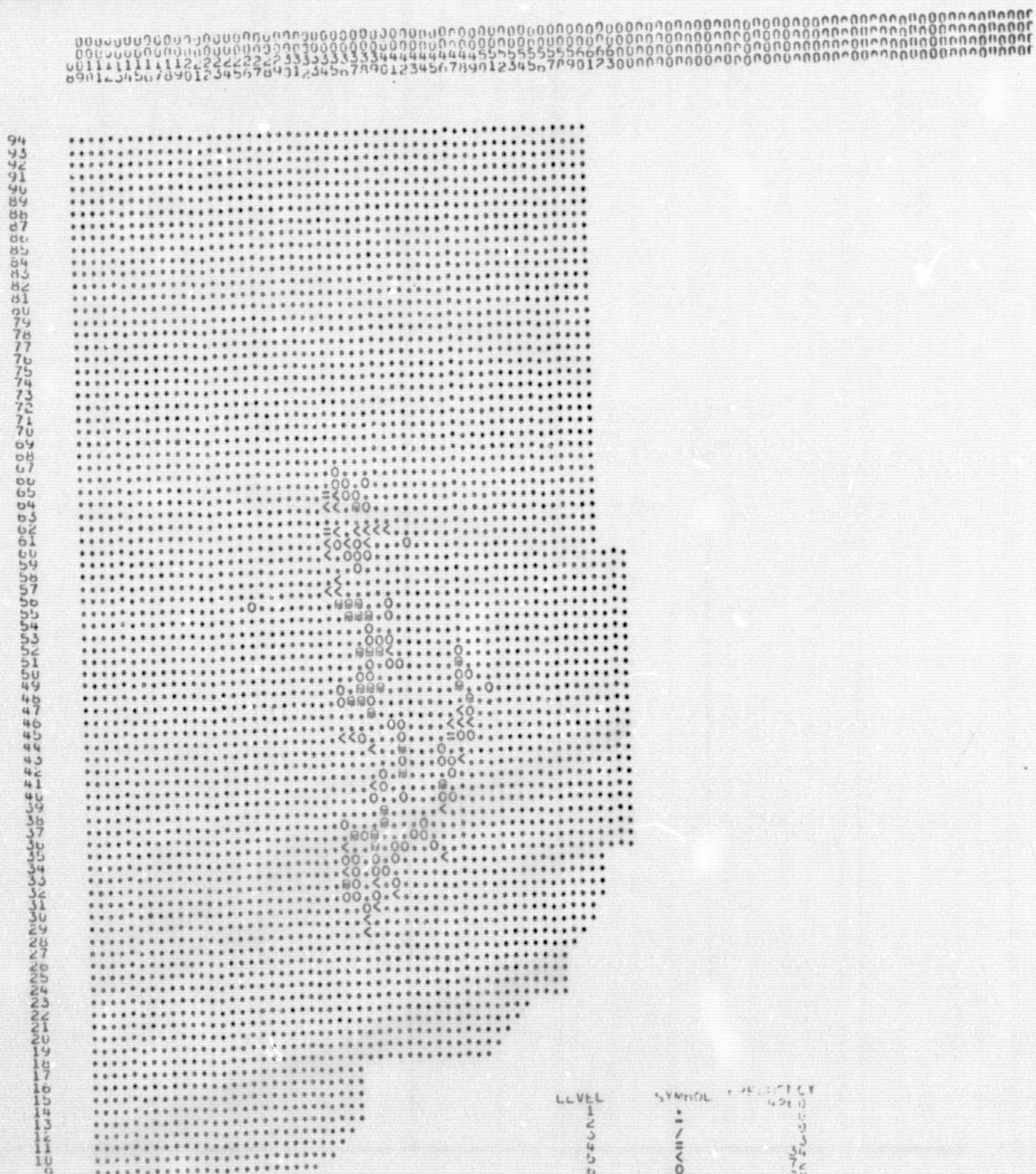
LEVEL	SYMBOL	FREQUENCY
1	.	3235
2	-	0
3	/	0
4	=	66
5	<	372
6	O	529
7	@	174
8	■	1
9		755

SUITABILITY INDEX NAME: MARINA

STUDY: ALPHA GROUP

NO.	VARIABLE NAME	0	1	2	3	4	5	6	7	8	9	WGT	PROPORTION
2	ASPECT	0	0	1	2	3	9	9	9	5	1	1.90	.12
3	SLOPE PERCENT CLASS	0	2	0	8	0	9	0	7	0	0	1.90	.12
5	SOIL CHARACTER	0	9	5	0	0	7	3	9	5	1	1.00	.06
6	FOREST STAND COMPOSITION	0	9	0	8	0	8	0	3	0	5	1.70	.11
9	FOREST STAND DENSITY CLASS	0	7	0	8	0	9	0	6	0	3	1.50	.10
10	FOREST STAND CONDITION CLASS	5	9	8	0	7	6	0	2	0	1	1.70	.11
17	CENTROID ELEVATION-CODED	0	9	3	0	0	0	0	0	0	0	1.90	.12
19	PROXIMITY TO PROPOSED LINE(260)	0	5	0	0	0	[illegible]	0	0	0	0	1.90	.12
20	PROXIMITY TO MINERALS&MINING	1	1	2	3	4	5	6	7	8	9	1.90	.12

NW CORNER COORDINATES= 8, 94



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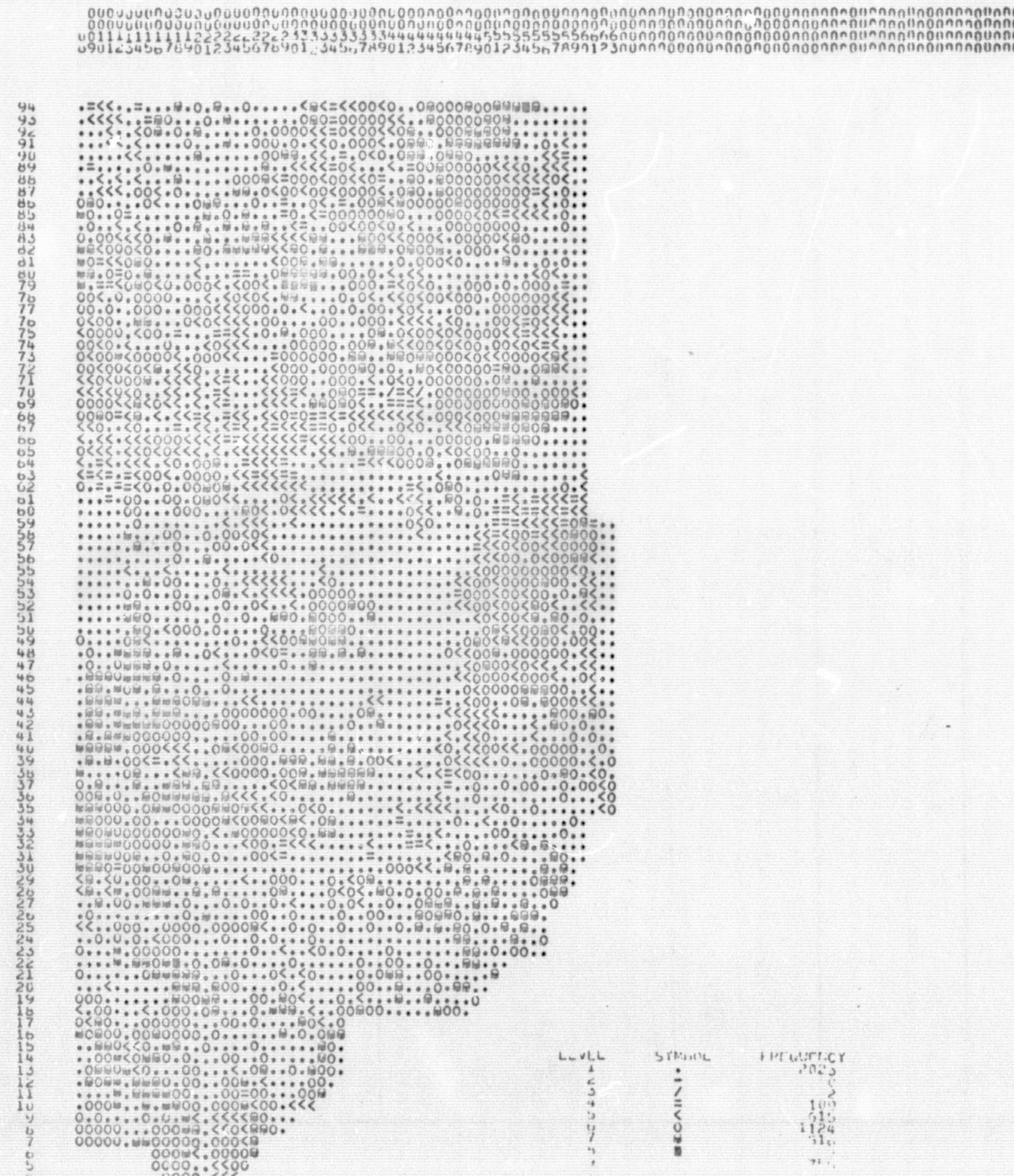
1	.	4210
2	-	[illegible]
3	/	[illegible]
4	=	[illegible]
5	<	34
6	O	72
7	@	28
8	■	0
9		[illegible]

SUITABILITY INDEX NAME: TRAILER CAMPING   STUDY: ALPHA GROUP

NO.	VARIABLE NAME	0	1	2	3	4	5	6	7	8	9	WGT	PROPORTION
2	ASPECT	0	0	1	2	3	9	9	9	5	1	1.80	.13
3	SLOPE PERCENT CLASS	0	7	0	9	0	5	0	0	0	0	1.80	.13
4	TOPOGRAPHIC POSITION	0	9	9	0	9	9	7	0	0	0	1.80	.13
5	SOIL CHARACTER	0	9	5	0	0	8	4	8	4	1	1.50	.11
6	SOIL WATER REGIME	0	9	0	7	0	3	0	0	0	1	1.50	.11
7	SURFACE WATER	4	8	6	0	9	0	8	8	0	8	1.10	.08
8	FOREST STAND COMPOSITION	0	9	0	8	0	8	0	3	0	5	1.50	.11
9	FOREST STAND DENSITY CLASS	0	7	0	9	0	7	0	5	0	3	1.50	.11
10	FOREST STAND CONDITION CLASS	5	9	8	0	7	6	0	2	0	1	1.50	.11

NW CORNER COORDINATES=   8, 94



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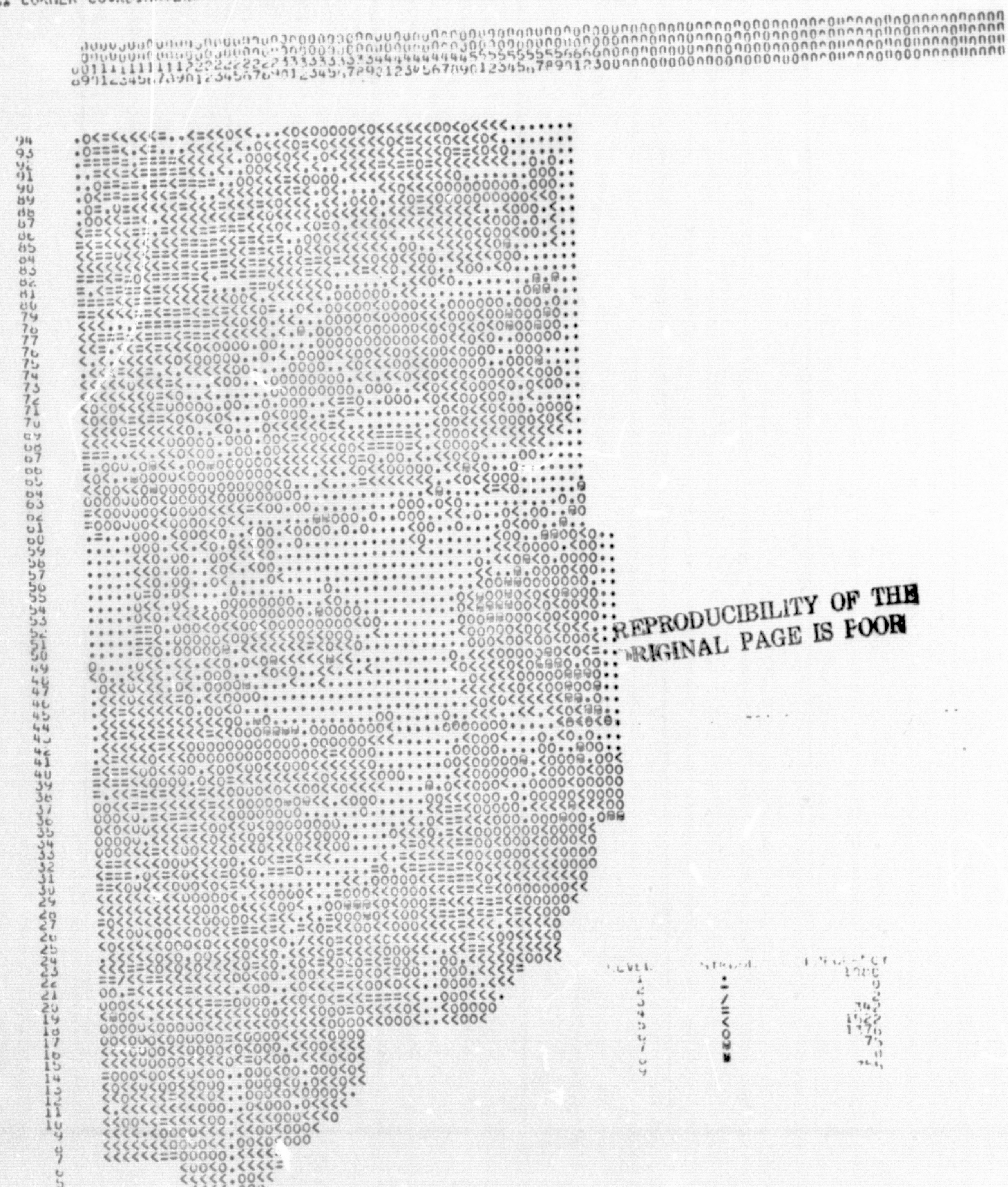
3	/	2
4	=	109
5	<	615
6	O	1124
7	▣	316
8	■	[illegible]
9	[illegible]	[illegible]

SUITABILITY INDEX NAME: SEWAGE/SANITARY STUDY: ALPHA GROUP

NO.	VARIABLE NAME	0	1	2	3	4	5	6	7	8	9	WGT	PROPORTION
2	ASPECT	0	0	9	9	7	2	1	1	1	9	1.40	.13
3	SLOPE PERCENT CLASS	0	3	0	9	0	8	0	7	5	1	1.70	.11
4	TOPOGRAPHIC POSITION	0	7	7	0	7	9	7	0	0	0	1.50	.10
5	SOIL CHARACTER	0	5	6	0	0	8	9	2	4	7	1.80	.12
6	SOIL WATER REGIME	0	9	0	9	0	1	0	0	0	0	1.70	.11
7	SURFACE WATER	0	7	3	0	0	0	0	0	0	0	1.30	.09
9	FOREST STAND DENSITY CLASS	0	1	0	3	8	5	0	7	0	9	1.00	.07
20	PROXIMITY TO MINERALS/MINING	6	7	8	9	8	7	6	5	4	3	1.20	.08
21	PROXIMITY TO UNIMPROVED ROADS	5	6	7	9	8	[illegible]	6	5	4	3	1.70	.11
26	PROXIMITY TO EXISTING ACTIVITY	1	2	3	3	4	5	6	7	8	9	1.40	.09

** CORNER COORDINATES= 0, 94



REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

LEVEL	SYMBOL	FREQUENCY
1	.	1900
2	-	9
3	/	2
4	=	342
5	<	1522
6	O	1376
7	@	75
8		0
9		[illegible]

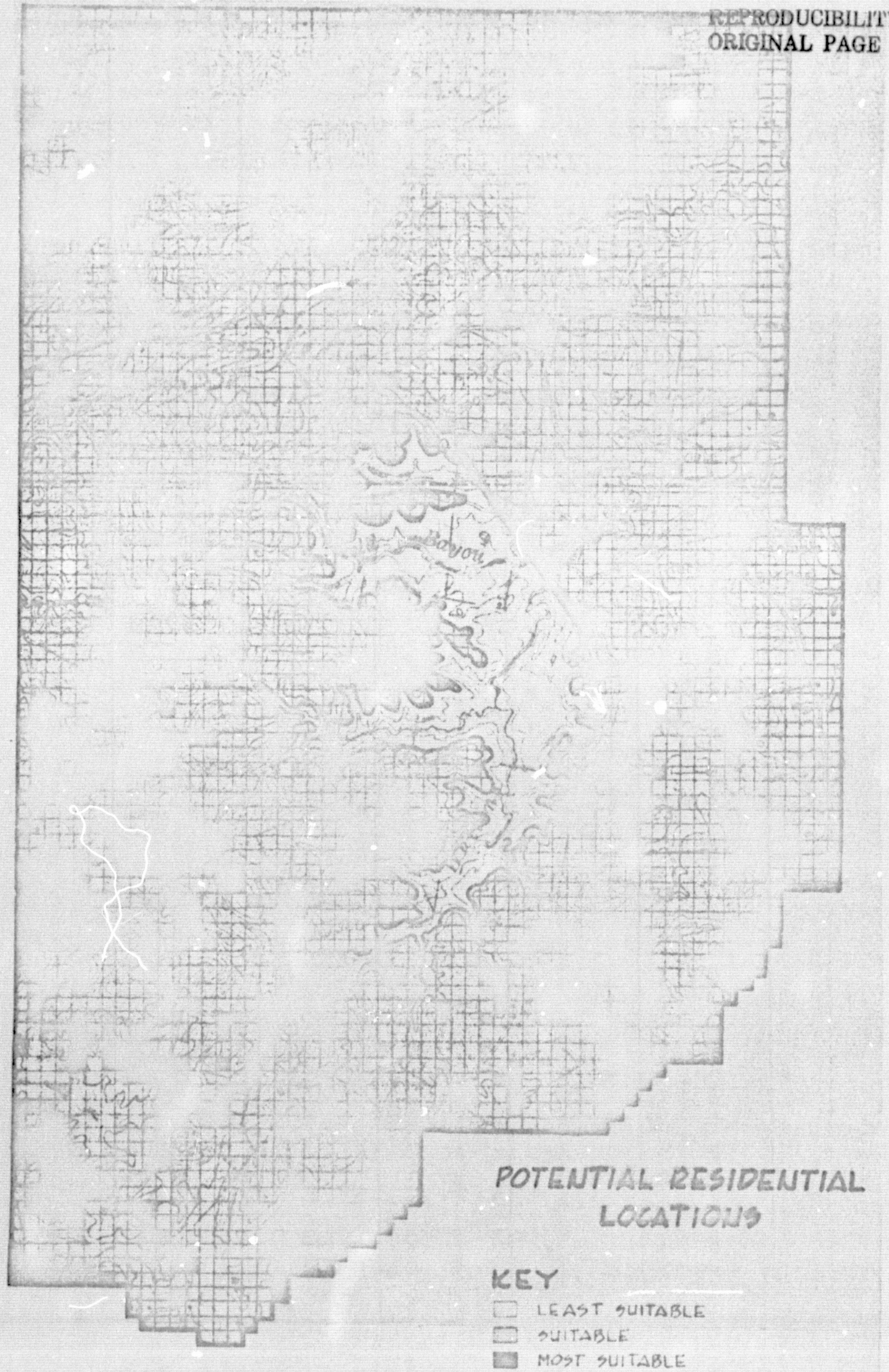
To allow more flexibility in design we have developed a gridded series of maps for the site. We combined levels least suitable, suitable and most suitable areas for potential site development.

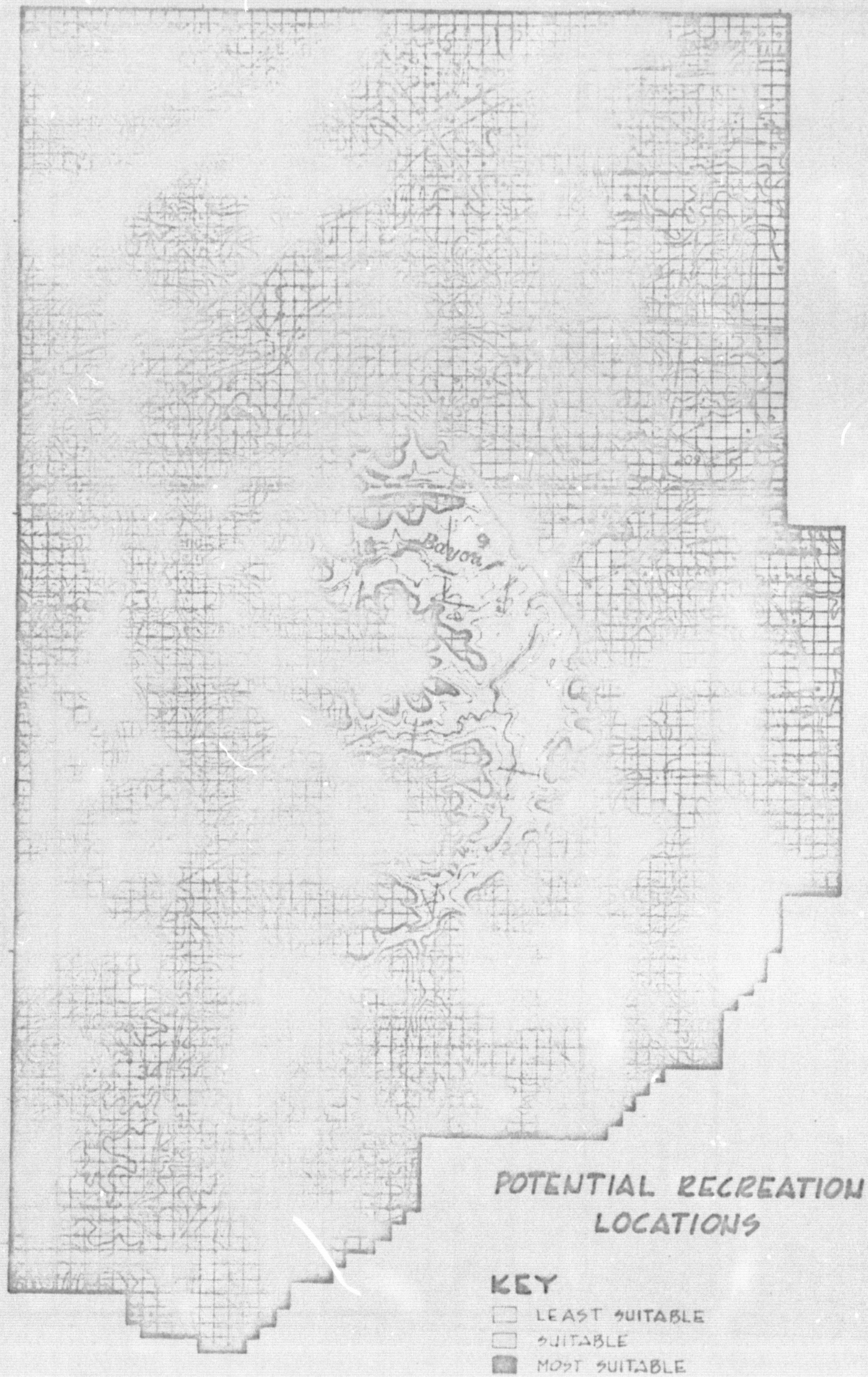
Levels 1, 2, 3 ---------- Least Suitable

Levels 4, 5, 6----------- Suitable

Levels 7, 8 ------------ Most Suitable

The following maps are graphic representations of this grouping process.


Bayou
POTENTIAL RESIDENTIAL
LOCATIONS
KEY
LEAST SUITABLE
SUITABLE
MOST SUITABLE


Bayou
POTENTIAL RECREATION LOCATIONS
KEY
LEAST SUITABLE
SUITABLE
MOST SUITABLE

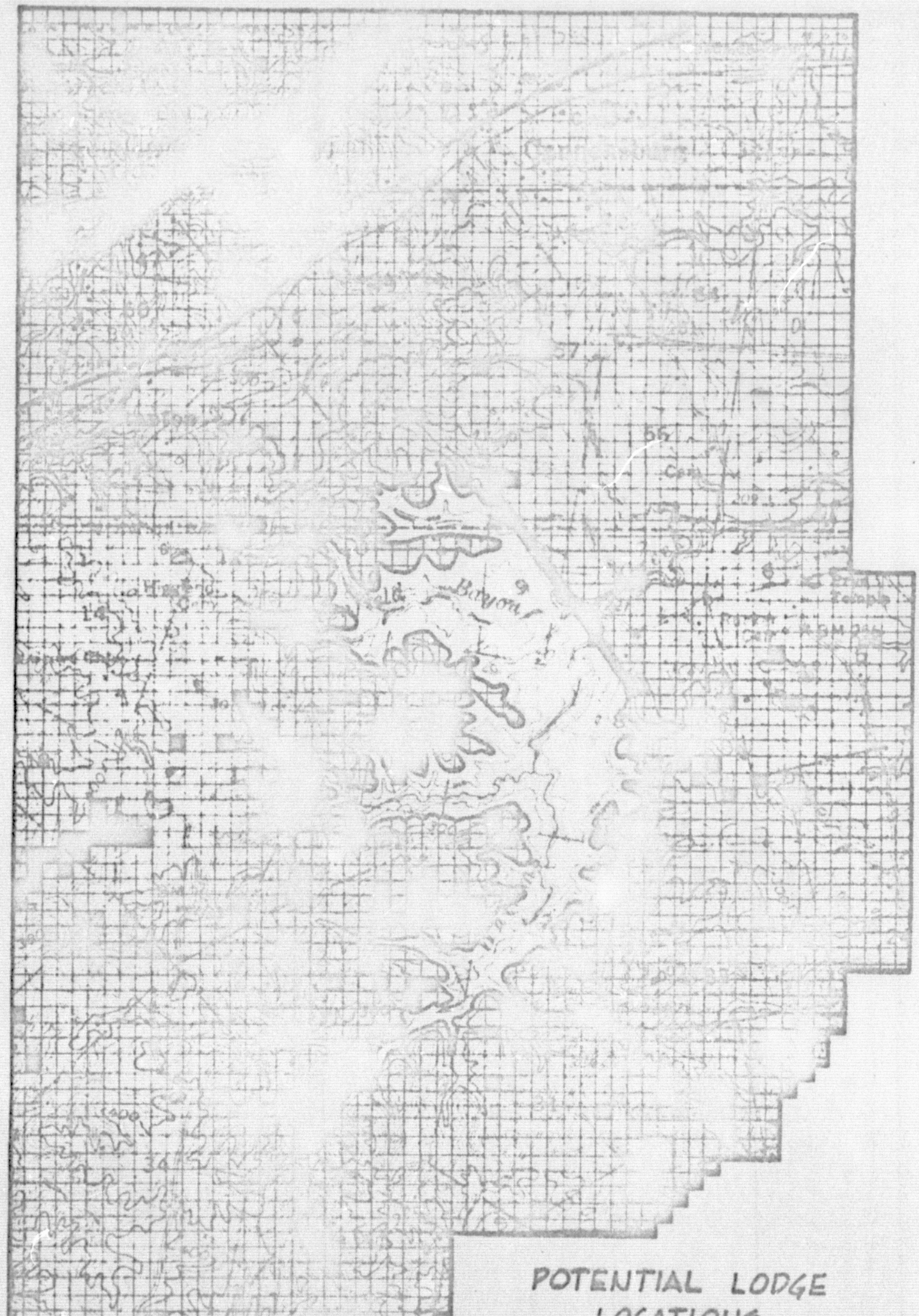
POTENTIAL INDUSTRIAL PARK LOCATIONS

KEY

LEAST SUITABLE

SUITABLE

MOST SUITABLE



POTENTIAL LODGE LOCATIONS

KEY

- LEAST SUITABLE
- SUITABLE
- MOST SUITABLE

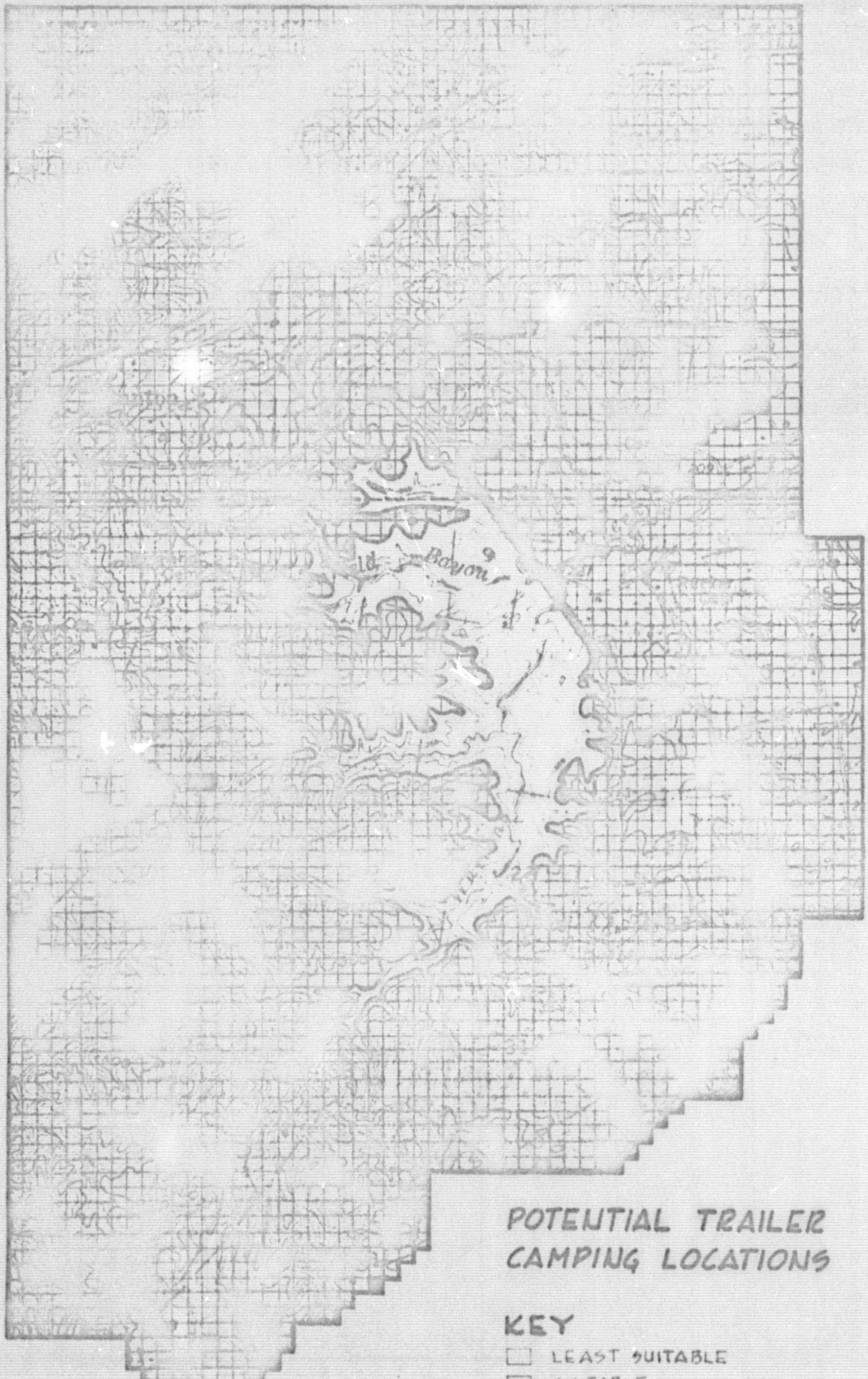
POTENTIAL MARINA
LOCATIONS

KEY

LEAST SUITABLE

SUITABLE

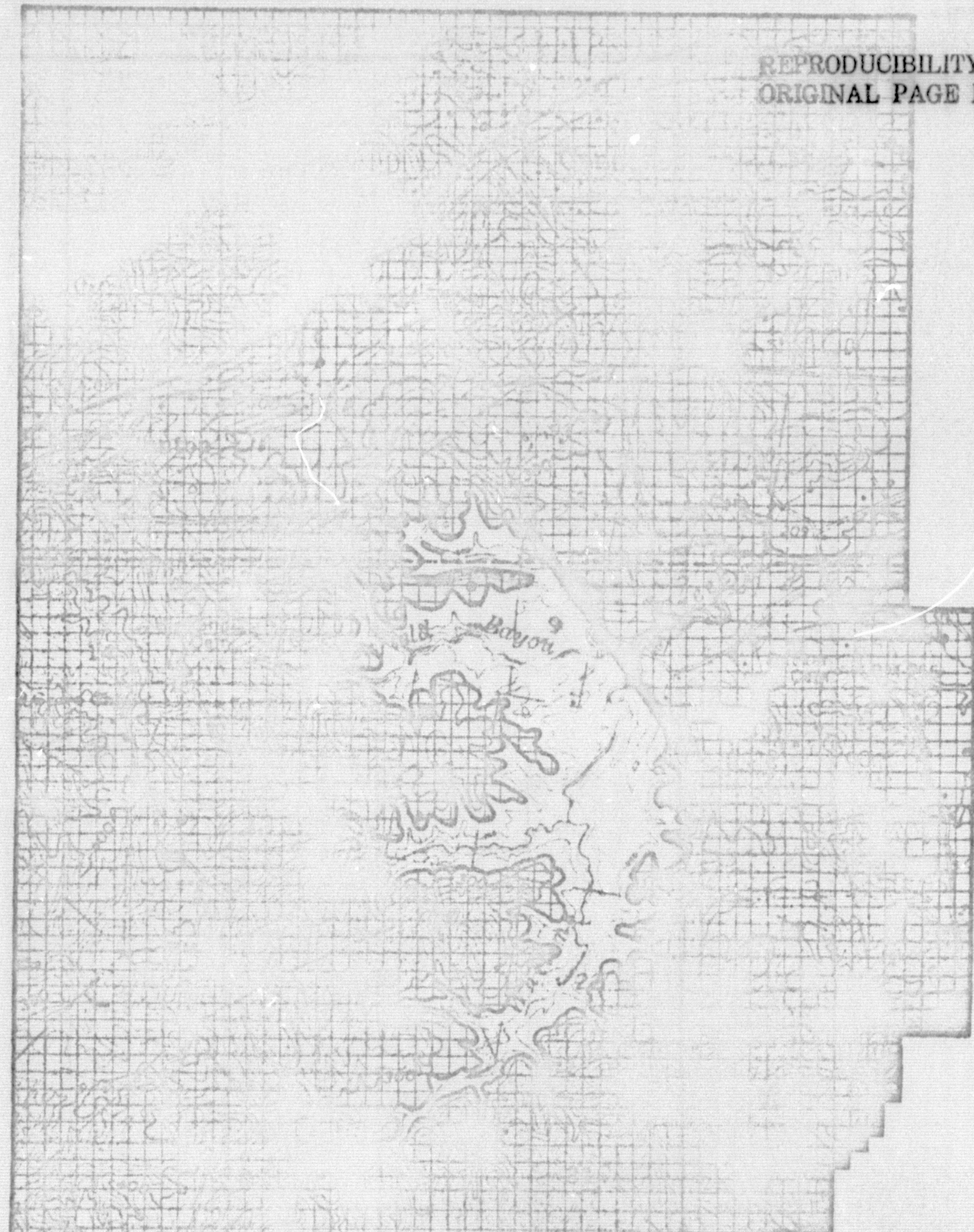
MOST SUITABLE



POTENTIAL TRAILER CAMPING LOCATIONS

KEY

- LEAST SUITABLE
- SUITABLE
- MOST SUITABLE



POTENTIAL SEWAGE
TREATMENT/LANDFILL
LOCATIONS

KEY

- LEAST SUITABLE
- SUITABLE
- MOST SUITABLE

SUMMARY

This design program is a booklet organized by the research team in order to analyze, synthesize, and apply the information that has been gathered during a three week period. The design concept, goals, and objectives have been established; the methods of data gathering and existing conditions in the study area have been stated; and variables have been assigned to the land uses. The computer has received the information selected by the team in the form of the design models and feedback from the computer has been received and re-evaluated by the team. The re-evaluation has consisted of determining whether the computer feedback (map print-outs) is the information desired by the team through the design models. Research as a team now comes to an end in order that each individual member may explore the development of a master plan and subsequent decisions relating to the design of the land use areas.

FOOTNOTES

1. Department of Forestry, Mississippi State University, Natchez State Park Study: p. 1.
2. IBID. p. 1
3. Bureau of Outdoor Recreation, Mississippi Park Commission, Mississippi Research and Development Center, Executive Summary, 1973: p. 22 - 24.
4. IBID, p. 22 - 24
5. Department of Forestry, Natchez State Park Study, p. 2
6. Mississippi Research and Development Center, Statistical Information on America's New Industrial Frontier - Mississippi, 1972: p. 35
7. Department of Forestry, Natchez State Park Study, p. 4 - 10
8. Bureau of Outdoor Recreation, Mississippi Park Commission, Mississippi Research and Development Center, Executive Summary, 1973: p. 20
9. Department of Forestry, Natchez State Park Study, p. 4 - 12

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Bureau of Outdoor Recreation, Mississippi Park Commission and Mississippi Research and Development Center, Executive Summary - Mississippi Statewide Comprehensive Outdoor Recreation Plan: 1973.

Department of Forestry, Mississippi State University, Natchez State Park: A Demonstration Study of Remotely Sensed Data Gathering and Computer Assisted Systems Analysis of Land Planning.

Ellis, Arndt, and Truesdell, Inc. Architects, Consulting Engineers, Landscape Architects, Camp Consultants. Master Plan for Camp Yntema. Flint, Michigan: April 4, 1972.

Fogg, George E. Park Planning Guidelines, National Society for Park Resources; 1975.

Gonia, Laur, and Bartlow, Arlene, Master Plan - Hill and Hollow Camp Site. Girl Scouts of the U.S.A. Frederick County, Maryland: January 24, 1972.

LTA Limited, Landscape Architects - Planning Consultants, Comprehensive Plan for Tishimingo State Park., Jackson, MS., March 1975.

Mississippi: Research and Development Center, Statistical Information on America's New Industrial Frontier - Mississippi: 1972.

APPENDIX 4

PAPER NO.

ASSESSMENT OF LOGGING CHANCE FROM REMOTELY SENSED DATA

by

W. Frank Miller and W. F. Watson
Department of Forestry
Mississippi State University
Mississippi State, MS

For Presentation at the 1976 Winter Meeting
AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS

Palmer House
Chicago, Illinois
December 14-17, 1976

SUMMARY: A method of terrain analysis employed in delineation of Land Capability Units having similar biologic and edaphic characteristics is presented. The information was obtained by interpretation of high-altitude, color infrared imagery. A small area was selected and a logging plan was developed that would minimize environmental damage and construction expense. Development of a computerized geo-information system is discussed.

American Society of Agricultural Engineers
St. Joseph, Michigan 49085

ASSESSMENT OF LOGGING CHANCE FROM REMOTELY SENSED DATA

by

W. Frank Miller and W. F. Watson
Department of Forestry
Mississippi State University
Mississippi State, MS

INTRODUCTION

Past logging operations in the Southeast were relatively small involving only a moderate capital outlay, and little detailed planning was done. The lack of planning resulted in haphazard road construction, skid trail layouts which failed to take advantage of the terrain, and a general degradation of many logging chances due to inappropriate equipment operating on fragile sites.

The U.S. Court for the District of Columbia recently ruled that point-source discharges from silvicultural practices could not be exempted by EPA under Section 402 of the 1972 Federal Water Pollution Control Act Amendments (PL-92-500); thus, poor logging practices can no longer be accepted. In addition, many wood producers now may have investments of up to one-half million dollars in equipment, and unproductive time due to immobilized skidders and haul trucks, and the use of skidders to tow haul trucks or right overturned chip trailers is poor economics. Also, landowners are increasingly aware of environmental degradation due to the use of improper equipment for the prevailing soil and weather conditions.

In light of the above considerations, the detailed planning of logging operations in the Southeast has become a necessity. This paper presents a method of land capability analysis to serve as a basis for planning.

TERRAIN ANALYSIS

The concept of terrain analysis performed on aerial imagery is not new - geologists have been utilizing the concept for years; however, its application in land capability classification is relatively new. Land Capability Classification (LCC) is a method of grouping land areas of similar use and productivity potentials. In order to classify, differences in surface drainage patterns and density or texture of the patterns must be recognized and related to the nature of the geologic substrate, soil associations, and general topographic situations.

Most Common Coastal Plain Drainage Patterns

Four of the most common Coastal Plain drainage patterns are dendritic, pinnate, parallel, and deranged or meandering.

Dendritic Pattern. A dendritic pattern (probably the most common in the Southern Coastal Plain) is characterized by the tree-like branching system in which the laterals join the gently curving main stream at acute angles (Figure 1). This pattern indicates fairly homogeneous, uniform soil or geologic materials, and the density or texture depends upon the degree of dissection. A deeply dissected area would have a fine density (main streams less than 0.05 inch apart at 1:120,000 scale); a moderately dissected terrain would have a medium density (mains 0.06 to 0.33 inches apart at 1:120,000), and lands with low relief would have a coarse density (mains greater than 0.33 inch apart).

Pinnate Pattern. A pinnate pattern is a modified form of dendritic pattern which is featherlike (Figure 2). It indicates a high silt content in the soil - either loessial deposits or fine-textured alluvium. If the material is loess, the degree of dissection will be dependent upon the nature of the underlying geologic materials.

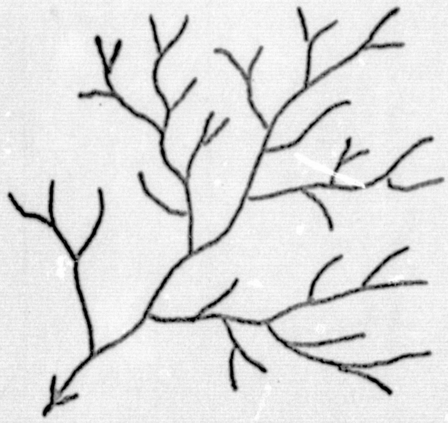

Fig. 1. Dendritic pattern

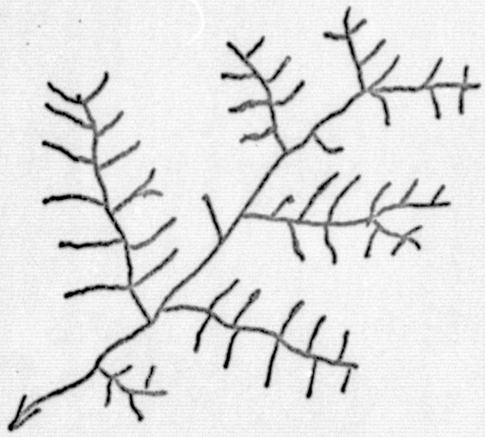

Fig. 2. Pinnate pattern

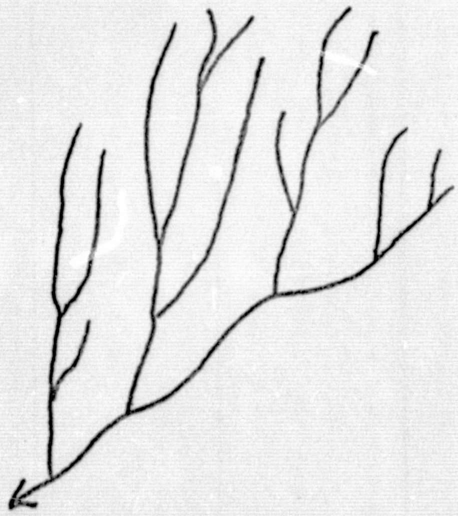

Fig. 3. Parallel pattern

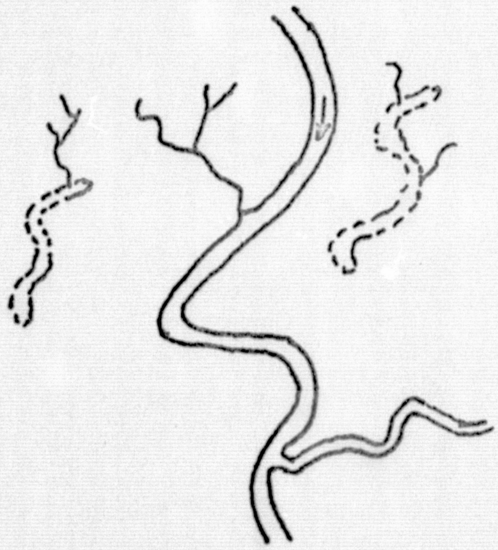

Fig. 4. Meandering pattern

Parallel Pattern. Parallel patterns are developed on homogeneous materials with gently sloping, uniform surfaces (Figure 3). In the Coastal Plain, this description fits two major land types - the Lower Coastal Plain, and portions of the Upper Coastal Plain which are developed from fine-textured substrates. The degree of dissection is dependent upon the dip of these strata.

Deranged or Meandering Patterns. The typical pattern in Coastal Plain alluvium is termed deranged or meandering (Figure 4). This pattern is modified to a coarse dendritic on old river terraces now in an upland position.

Land Capability Classification - Manual Interpretation

The manual interpretation of high-altitude aircraft coverage utilizing the concept of terrain analysis can yield a large amount of information on geology, soils, topography, and vegetation. A color infrared image taken in December at a scale of 1:120,000 was used an an example. The area covered by one frame of this imagery is approximately 186,000 acres. Comparison of the image with a State Geological Map indicates that 3 major geologic formations occur in the area - the Eutaw Formation on the east, the Tombigbee Sand Member of the Eutaw in the center, and the Selma Chalk Group on the west. With this limited amount of information, certain probabilities can be established. The Selma Group was deposited in a deep, marine environment and the resulting soils and topography can be characterized as a nearly level plain with gently rolling topography and soils with slow internal drainage. The Tombigbee Sands are continental in nature, and consequently are coarse-textured; the resultant topography is deeply dissected. The Eutaw Formation is also continental in nature, but is medium-textured, and only moderately dissected.

With this information in hand, the aerial image is viewed and drainage pattern and density are analyzed. Figure 5 is a photograph of a black and white infrared image illustrating the western portion of the test

Figure 5. A portion of southcentral Monroe County, MS. Western portion of the study area.

area. The parallel patterns west of the gravel road indicate a gently rolling, fine-textured material. There is, however, an ecological and land use division in the material. The more heavily forested area contains large quantities of pine timber, a species which will not reproduce well on alkaline soils. Therefore, a division is made and the western portion of the clays are designated Alkaline Clays, and the eastern portion the Acid Clays. Proceeding to the east, the next Land Capability Unit (LCU) encountered is designated the Tombigbee Sand Hills. The fine, dendritic pattern indicates a deeply dissected, coarse-textured material. The next LCU encountered is the Tombigbee River floodplain which lies east of the Sand Hills (Figure 6); it is characterized by the typical meander pattern of Coastal Plain rivers. The next LCU is designated as the Old Terraces. The meander pattern has been modified to coarse dendritic, largely due to the nearly level topography and the development of fragipans (inhibiting layers) in the soils.

A brief field examination of representative sites should serve as ground truth to establish broad soil grouping within each LCU. However, if a County Soil Survey is available, even from a county somewhat removed but with the same geologic strata, the information illustrated in Tables 1 and 2 can be obtained. Based partially on the information contained in Table 1, Table 2 was derived.

The information given in Tables 1 and 2, extended to other soil members of the association, should prove invaluable to a logging superintendent concerned with planning operations. Each LCU has its own unique set of physical characteristics, and these combined with forest stand information (composition, stem size, stand density, and area), comprise the data base for planning. In addition, slope percent can be determined by photogrammetric processes if topographic maps are not available.

Figure 6. A portion of Southcentral Monroe County.

The eastern portion of the test area.

Figure 7 presents an overlay from a portion of Figure 5, illustrating the manner in which information concerning logging layouts can be obtained from manual interpretation. Stands A and B are located at the foot of the Tombigbee Sand Hills escarpment in the Tombigbee River alluvium. The stands are approximately 20-year old plantations of pulpwood size. Stand A is approximately 37 acres in area, and it is separated from Stand B (170 acres) by a narrow oxbow.

Figure 7. An enlarged portion of Fig. 5, illustrating a potential layout for a logging operation.

Table 1. Brief description of a representative soil mapping unit from each LCU, and estimated physical properties. Adapted from Soil Survey Series 1961, No. 37, Monroe County, MS.

Map Symbol	Soil Name	Depth From Surface	USDA Texture	Permeable In./Hr.	Shrink-Swell Potential
BrA	Brooksville silty clay, 0-2% slope; somewhat poorly drained	0-10"	Silty Clay	0.50-0.20	Moderate
		10-17"	Clay	0.00-0.05	Mod-High
Eu	Eutaw silty clay, deep, somewhat poorly drained	0-1"	Silty Clay	0.80-2.50	High
		1-5"	Silty Clay Loam	0.20-0.80	Mod-High
		5-9"	Silty Clay	0.00-0.05	High
		9-21"	Clay	0.00-0.05	High
Rt F2	Ruston and Luverne soils 17-45% slope, eroded; well drained	0-8"	Fine Sandy Loam	0.80-2.50	Low
		8-20"	Loam	0.80-2.50	Low
		10-33"	Loam	0.80-2.50	Low
La	Leaf silt loam, poorly drained	0-3"	Silt loam	0.80-2.50	Low
		3-20"	Clay loam	0.20-0.80	Moderate
St	Stough fine sandy loam; somewhat poorly drained	0-6"	Loam	0.80-2.50	Low
		6-12"	Silt loam	0.20-0.80	Low-Moderate

The questions posed were, "What is the haul road route that will minimize environmental damage and construction costs?", and "Where could well-drained loading decks be located to minimize skidding distance?". Based on manual interpretation of stereo-pair of images, four deck locations on the route of the haul road were selected as indicated on Figure 7. Road construction can be held to approximately 7,577 feet, and by identification of high ground, only 1330 feet will require gravel. Improvement of existing roads will constitute the remainder of the construction; 4580 feet will require general improvement, and 1667 feet will require only minimal work.

The environmental consequences of harvesting can be held to a minimum with these deck locations. Skidding will be uphill and there will be no need to skid across the drains. Thus, only a small protion of soil particulate matter will be delivered to the stream or river. Streamflow would not be interrupted if a culvert were installed at the stream crossing below the dam.

In The Future

The Corps of Engineers has developed a mobility analysis for the Department of Defense at the Waterways Experiment Station at Vicksburg, Mississippi. This technique is in essence a computerized geo-information system in which variables affecting mobility of tracked and wheeled vehicles are "stacked" in cells. The cells can be of any area. The three general types of inputs are: terrain variables, vehicle dynamics, and operator performance (vision and operator response at certain speeds). Examples of variables are location of urban, industrial, or commercial centers, soil wetness, slope, soil textural classes, and vegetation. The algorithm utilized will print out the route on which a given vehicle

Table 2. Interpretation of engineering properties of a soil mapping unit from each LCU. Adapted from Soil Survey Series 1961, No. 37, Monroe County, MS

Map Symbol	Suitability As A Source Of Topsoil	Sand	Gravel	Road Fill	Soil Features A Road Loca.	Dikes or Levees
BrA	Poor	Unsuitable	Unsuitable	Poor	High water table and shrink-swell	Low strength and stability
Eu	Poor	Unsuitable	Unsuitable	Poor	High Water table, erodible	Unstable, high shrink-swell
Rt F2	Good	Fair	Fair	Good	Favorable	Good strength and stability
La	Fair to Poor	Unsuitable	Unsuitable	Fair	Fair, high water table	Moderate strength and stability
St	Fair to Good Above Fragipan	Fair	Fair	Fair	High water table, pan at 15-20"	Moderate strength and stability

can achieve a stated speed. Mississippi State University has developed a similar though probably not so sophisticated technique which is also a computerized geo-information data base wherein variables can be "stacked" by cells. Any variable which is point or location specific can be introduced into the system from a data base which is at any scale. Data from bases ranging from 1:24,000 to 1:120,000 have been utilized. This is accomplished through the use of a line-following digitizer. The output from the algorithm can be in the form of single variable maps such as a geodetically corrected map indicating location of all pure pine stands, or physical situations with high load-bearing capacity, and eventually, through a process of variable ranking, an estimate of trafficcability. This system has been successfully applied to various problems in land and resource planning. The next application will be in the area of logging operations.

APPENDIX 5

MISSISSIPPI EDITION THE C

THE COMMERCIAL APPEAL 2/24/77

Ainsworth Sees Money Doubling Under Land Bill

JACKSON, Miss. (UPI) — State Land Commissioner John Ed Ainsworth predicted Wednesday that passage of a controversial 16th Section land bill would more than double the amount of money generated for public schools from the property during the next 10 to 15 years.

The measure, passed earlier by the House, would sharply revise laws dealing with management and leasing of 16th Section lands and give the land commissioner additional authority in supervising the property. However, the leasing would remain in the hands of local boards of supervisors with approval by county school boards.

Ainsworth, who recommended the bill, said management of 16th Section lands — representing property set aside in various counties to help generate funds for public schools — has been "a problem facing this state for many years. It is not going away. It has to be settled."

Ainsworth was among several persons who appeared before a Senate subcommittee studying the bill. Sen. Mitch Childer of Pearl, chairman of the sbucommittee, said he hoped the panel would be ready to act on the measure later this week.

The measure was endorsed by representatives of the Mississippi Economic Council, Mississippi Association of Educators, League of Women Voters, the state AFL-CIO and a citizens group known as Rankin Countians for Better Education.

Testifying against the bill were Sen. Joe Mulholland of Philadelphia and Dr. Roland Byrd, a Louisville veterinarian who said he was representing a group of 16th Section leaseholders in central Mississippi. Byrd said he agreed that some changes are needed in 16th section lands, but added: "I do not think this bill is a solution."

Mulholland said he felt the best approach would be to adopt a constitutional amendment permitting the sale of 16th Section lands under conditions that would be worked out later by the Legislature. He said he had introduced such a proposal but it died in committee.

Ainsworth said the bill was an attempt to curb alleged abuses in 16th section leasing, increase revenues for the schools, and provide reporting procedures to assure that adequate information is available on 16th Section lands. At the same time, he said the measure sought to deal fairly with persons who live on 16th Section land.

Ainsworth estimated about $6 million was now being generated for the schools from 16th Section lands. He said studies indicate the figure would increase gradually to a minimum of $18 million within 10 to 15 years if the bill is approved.

Ainsworth said he would not oppose a land-swapping proposal offered by Byrd, but questioned whether the plan could be implemented without a constitutional amendment. Byrd said he was concerned that the bill did not adequately protect the rights of persons who have lived on 16th Section lands "generation after generation."

Under his suggestion, the state would purchase in-lieu lands that would be swapped for 16th Section lands, with the leaseholders repaying the state for the land and keeping their homesites.

Rita Riggins, president of the Rankin Countians for Better Education, said the House-passed bill was not a "cure-all" but felt it was the "most comprehensive bill ever introduced" in the Legislature. She said many individuals and companies have "too long benefited from low-priced, long-termed leases.

"They are minority," she said. "There are approximately 5,000 16th Section land leases in Mississippi and 15,000 subleases." She said this represents less than one per cent of the state's population.

Claude Ramsay, president of the Mississippi AFL-CIO, charged there had been "much abuse" in management of 16th Section lands. "Certain individuals have leased these lands for a mere pittance and have then made a fortune by subleasing that land," he said.

Clyde McLeod, director of research for the Mississippi Economic Council, said the MEC has long pushed for reforms in 16th Section land laws. He said the bill did not agree "in every detail" with MEC recommendations. "However, we can say that passage of this bill would put the state giant steps forward in securing revenues from these lands which can benefit the school children in the state without adding to the tax burden of our citizens," he said.

Mulholland said the amount that would be produced by the bill would be "nominal" compared with the total costs of the schools. "I don't think this bill is a fair solution to the problem," he said.

APPENDIX 6

APPENDIX 7

Jan. 11,1977

LOWNDES COUNTY LAND USE
Data Base

Cell size = 2ha = 5ac (467' x 467')

Physical Cultural and Biological Site Factors

Variable #	Variable	Code	Data Card Column
	North Coordinate		1 - 3
	East Coordinate		4 - 6
#1	Centroid Elevation	nearest 10'	7 - 9
#2	Slope Percent Class (SCS)		10
	0 - 2	1	
	2 - 5	3	
	5 - 8	5	
	8 - 12	7	
	12 - 17	8	
	17 - 45	9	
#3	Soil Character		11
	Medium texture,noneroded	1	
	Medium texture, eroded	2	
	Fine texture, non-expansive		
	noneroded	3	
	eroded	4	
	Fine texture, expansive		
	non-eroded	5	
	eroded	6	
	Coarse texture, noneroded	7	
	Coarse texture, eroded	8	
	Gullied lands	9	
#4	Soil Wetness		12
	Moist - MWD, WD	1	
	Dry - SED, ED	3	
	Wet - SPD, PD	5	
	Ponded - VPD	7	
#5	Surface Water		13
	No water	0	
	3rd order stream	1	
	2nd order stream	2	
	1st order stream	4	
	river 100'	6	
	lake (more than 10 ac.)	7	
	pond	9	

#6	Forest Cover - 25% or Greater Stocking			14
	Open		0 Pine-hardwood	
	regeneration	1		
		pulp	2	
		sawlog	3	
	Hardwood	regen	4	
		pole	5	
		saw	6	
	Pine	regen	7	
		pole	8	
		saw	9	

Cultural Site Factors

#7	Agricultural Activity		15
	No Activity	0	
	Pasture	1	
	Row cropping	3	
	Other	5	
#8	Existing Cultural Land Use		16
	None	0	
	Agric.	1	
	Forestry	2	
	Low density resid.	3	
	Hi density resid. (4+/ac)	4	
	Cemetary	5	
	Public & Utilities	6	
	Commercial	7	
	Industrial	8	
	Recreation - Active	9	
#9	Transportation and Right-of-Way		17
	Heavy duty	1	
	Med. duty	3	
	Light duty	5	
	Unimproved	7	
	RR	8	
	None	9	
#10	Utility Rights-of-Way		18
	None	0	
	Gas or oil pipelines	1	
	REA lines	3	
	TVA Transmission lines	5	
#11	Aquifer Recharge Areas		19
	Present	1	
	Absent	3	

#12	Flood Limits 100 yr.		20
	Within limit	1	
	Above limit	3	

#13	City Limits of incorp. towns		21
	Within	1	
	Out	3	

#14	Utilities		22
	None	0	
	Electricity only	1	
	Water only	3	
	Electricity and water	5	
	Electricity, water & sewage	7	
	Gas	9	

Search Variables

#15 (S-1)	Proximity to Proposed Waterway		23
	in cell	0	
	within 1 cell	1	
	within 2 cells	2	
	.	.	
	.	.	
	.	.	
	within 8 cells	8	
	9 cells or more away	9	

#16 (S-2)	Proximity to City Limits		24
	In city limits	0	
	Within 2 cells of	1	
	Within 4 cells of	2	
	Within 6 cells of	3	
	.	.	
	.	.	
	.	.	
	Within 18 cells of	9	

#17 (S-3)	Proximity to Medium Duty Roads		25
	Road in cell	0	
	Road within 2 cells	1	
	Road within 4 cells	2	
	.	.	
	.	.	
	.	.	
	Road within 16 cells	8	
	Road 18 cells or more away	9	

#18 (S-4)	Proximity to Heavy Duty Roads		26
	Road in cell	0	
	Road within 2 cells	1	
	Road within 4 cells	2	
	.	.	
	.	.	
	.	.	
	Road within 16 cells	8	
	Road 18 cells or more away	9	
#19 (S-5)	Proximity to Railroads		27
	In cell	0	
	Within 2 cells	1	
	Within 4 cells	2	
	.	.	
	.	.	
	.	.	
	Within 16 cells	8	
	18 cells or more away	9	
#20 (S-6)	Proximity to Structures and Development*		28
	S & D in cell	0	
	S & D in 1 cell	1	
	S & D in 2 cells	2	
	.	.	
	.	.	
	.	.	
	S & D in 8 cells	8	
	S & D in 9 cells or more away	9	

(*Note: Excludes mobile homes)

#21 (S-7)	Proximity to Existing Activity *		29
	Activity in cell	0	
	Activity within 1 cell	1	
	Activity within 2 cells	2	
	.	.	
	.	.	
	.	.	
	Activity within 8 cells	8	
	Activity within 9 cells or more	9	

(Note: Existing activity includes agricultural activity, minerals and mining, structures & development except mobile homes, paved roads and railroads.

#22 (S-8)	Proximity to Water-excl. 2nd & 3rd Order Streams		30
	1st or 2nd order stream in cell	0	
	1st or 2nd order stream with 1 cell	1	
	1st or 2nd order stream with 2 cells	2	
	.	.	
	.	.	
	.	.	
	1st or 2nd order stream with 8 cells	8	
	Stream more than 9 cells away	9	
#23 (S-9)	Proximity to Landfills		31
	In the cell	0	
	2 cells away	1	
	4 cells away	2	
	.	.	
	.	.	
	.	.	
	18 cells away	9	
24 (S-10)	Proximity to Aquifer		32
	In cell	0	
	2 cells away	1	
	4 cells away	2	
	.	.	
	18 cells away	9	
25 (S-11)	Proximity to Medium & Heavy Duty Roads		33
	Within cell	0	
	2 cells away	1	
	4 cells away	2	
	.	.	
	.	.	
	18 cells away	9	
26 (S-12)	Proximity to Row Crop Activity		34
	Within cell	0	
	2 cells away	1	
	4 cells away	2	
	.	.	
	.	.	
	.	.	
	18 cells away	9	

APPENDIX 8

SUITABILITY INDEX EVALUATION FORM

Suitability Index Name COMMERCIAL-INSTITUTIONAL Study LOWNDES

Date ______

Variable No.	Variable Value 0	1	2	3	4	5	6	7	8	9	Weight	Weight Per Cent
12-Flooding	0	0	0	9	0	0	0	0	0	0	0	
2-Slope	8	9	7	2	1	0	0	0	0	0	9	17.6
3-Soil Chara.	0	9	8	7	5	1	1	8	3	1	9	17.6
14-Utilities	1	5	0	5	0	7	0	9	0	1	6	11.8
8-Exist. LU	0	7	5	6	5	0	5	9	7	1	9	17.6
9-Transpor.	0	9	0	9	0	5	0	1	5	0	12	23.5
16-Pr. City Lts	9	7	6	5	5	4	4	3	3	1	6	11.8

Rate each value for each variable from 1 (low) to 9 (high).

To reject a cell on a particular condition, code a 0 under those particular variable values.

SUITABILITY INDEX EVALUATION FORM

Suitability Index Name INDUSTRIAL

Study LOWNDES

Date 1/11/77

Variable No.	Variable Value 0	1	2	3	4	5	6	7	8	9	Weight	Weight Per Cent
11-Aquifer	0	0	0	9	0	0	0	0	0	0	0	
12-Flooding	0	0	0	9	0	0	0	0	0	0	0	
18-Pr. Hvy. Rd.	9	9	9	9	8	8	7	5	3	1	12	18.2
19-Pr. RR	9	9	9	8	7	5	3	1	1	1	12	18.2
15-Pr. Waterway	9	9	8	7	5	3	2	2	2	2	9	13.6
2-Slope	0	8	0	9	0	7	0	5	1	1	9	13.6
3-Soil Chara.	0	9	8	7	5	1	1	8	3	1	9	13.6
14-Utilities	1	5	0	5	0	7	0	9	0	1	6	9.1
8-Exist. LU	1	8	5	3	0	0	5	5	9	1	3	4.6
17-Pr. Med. Rds.	9	9	9	9	8	8	7	5	3	1	6	9.1

Rate each value for each variable from 1 (low) to 9 (high).

To reject a cell on a particular condition, code a 0 under those particular variable values.

SUITABILITY INDEX EVALUATION FORM

Suitability Index Name RESIDENTIAL

Study LOWNDES

Date 1/11/77

Variable No.	Variable Value 0	1	2	3	4	5	6	7	8	9	Weight	Weight Per Cent
12-Flood	0	0	0	9	0	0	0	0	0	0	0	
5-Surf. H_2O	9	0	0	0	0	0	0	0	0	0	0	
14-Utilities	1	4	0	2	0	7	0	9	0	3	9	15.3
3-Soil Chara.	0	9	7	8	6	3	2	5	4	1	12	20.3
2-Slope %	0	7	0	9	0	9	0	5	3	1	12	20.3
25-Prox. Tran.	0	3	7	8	9	8	7	7	6	6	4	6.8
8-Exist. LU	1	8	9	9	5	0	0	0	0	0	4	6.8
4-Soil H_2O	0	9	0	7	0	2	0	0	0	0	12	20.3
6-For. Cover	1	3	5	9	2	4	8	3	5	8	6	10.2

Rate each value for each variable from 1 (low) to 9 (high).

To reject a cell on a particular condition, code a 0 under those particular variable values.

SUITABILITY INDEX EVALUATION FORM

Suitability Index Name SANITARY LAND FILL

Study LOWNDES

Date 1/11/77

Variable No.	Variable Value 0	1	2	3	4	5	6	7	8	9	Weight	Weight Per Cent
12-Floods	0	0	0	9	0	0	0	0	0	0	0	
3-Soil Chara.	0	3	3	9	9	7	7	1	1	0	12	18.5
2-Slope	0	9	0	9	0	7	0	5	0	0	12	18.5
8-Exist. LU	0	6	9	0	0	0	5	0	0	0	9	13.8
16-Prox. City L	0	0	0	0	0	0	7	8	9	8	6	9.2
22-Prox. Surf H_2O	0	1	1	3	5	7	9	9	9	9	6	9.2
24-Prox. Aquif.	0	0	0	0	0	0	1	3	5	9	12	18.5
17-Prox.Med.Rds.	0	0	3	9	8	7	6	6	6	3	4	6.2
18-Prox. Hvy.Rd.	0	0	1	6	9	8	7	6	6	3	4	6.2

Rate each value for each variable from 1 (low) to 9 (high).

To reject a cell on a particular condition, code a 0 under those particular variable values.

SUITABILITY INDEX EVALUATION FORM

Suitability Index Name RECREATION-PASSIVE

Study LOWNDES

Date 1/11/77

Variable No.	Variable Value 0	1	2	3	4	5	6	7	8	9	Weight	Weight Per Cent
6-Forest Cov.	1	3	5	9	2	4	8	3	5	8	12	28.6
5-Surf. H_2O	3	4	5	0	6	0	9	9	0	6	9	21.4
8-Exist. LU	0	0	9	1	0	0	0	0	0	5	9	21.4
15-Pr. Waterway	1	3	9	9	9	9	9	7	5	3	6	14.3
3-Soil Chara.	0	9	8	7	6	5	4	7	6	1	6	14.3

Rate each value for each variable from 1 (low) to 9 (high).

To reject a cell on a particular condition, code a 0 under those particular variable values.

SUITABILITY INDEX EVALUATION FORM

Suitability Index Name RECREATION-ACTIVE

Study LOWNDES

Date 1/11/77

Variable No.	Variable Value 0	1	2	3	4	5	6	7	8	9	Weight	Weight Per Cent
2-Slope	0	8	0	9	0	7	0	3	1	1	12	22.2
16-Pr.City Lmts.	9	9	9	9	8	7	5	3	1	1	12	22.2
3-Soil Chara.	0	9	9	2	1	2	1	8	6	0	9	16.7
9-Transpor.	0	3	0	7	0	9	0	3	0	0	9	16.7
8-Exist. LU	0	3	5	8	9	0	5	3	1	9	9	16.7
22-Pr. H_2O	0	9	9	9	8	7	5	3	1	1	3	5.5

Rate each value for each variable from 1 (low) to 9 (high).

To reject a cell on a particular condition, code a 0 under those particular variable values.

SUITABILITY INDEX EVALUATION FORM

Suitability Index Name WILDLIFE HABITAT

Study LOWNDES

Date 1/12/77

Variable No.	Variable Value 0	1	2	3	4	5	6	7	8	9	Weight	Weight Per Cent
6-For. Cover	0	3	2	6	4	2	9	1	0	5	12	18.6
26-Pr.Row Crop	2	9	9	9	9	8	7	6	5	5	10	15.4
3-Soil Chara.	0	9	6	9	5	7	5	4	2	2	9	13.8
5-Surf. H_2O	2	3	7	0	9	0	9	5	0	9	9	13.8
8-Exist. LU	0	4	9	0	0	0	0	0	0	0	9	13.8
9-Transpor.	0	1	0	2	0	3	0	5	7	9	6	9.2
20-Pr.Str.&Dev.	0	0	0	0	0	6	7	8	9	9	6	9.2
4-Soil Wetness	0	7	0	5	0	9	0	3	0	3	4	6.2

Rate each value for each variable from 1 (low) to 9 (high).

To reject a cell on a particular condition, code a 0 under those particular variable values.

APPENDIX 9

MISSISSIPPI EDITION THE C

The Commercial Appeal
4/6/77

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Reclamation Rules Set To Be Drafted Despite Low Funds

By JAMES YOUNG
From The Commercial Appeal
Jackson, Miss., Bureau

JACKSON, Miss. — Barring an unexpected veto by Gov. Cliff Finch, state officials say they are ready to begin implementing the first stage of Mississippi's new reclamation law.

State geologist Bill Moore, whose agency will administer the mining permit system and regulate surface mine operators, says his staff is ready to begin work on the specific rules and regulations.

The executive secretaty of the state Soil and Water Conservation Commission says he is trying to map plans for conducting an inventory of existing surface mine operations for the survey by the Jan. 1 deadline.

Both officials said Tuesday that the lack of extra money may pose some problems in carrying out their new duties, but the full law will not go into effect until next April, after the 1978 legislative session.

Under the reclamation bill which has been sent to Finch for signing, the state Geological Survey must come up with proposed rules and regulations governing surface mine operation within 90 days, then hold a public hearing on the proposals.

Moore said Tuesday his staff has been looking over the bill to begin work on the regulations, and he has received offers of help from some mine operators, university personnel, reclamation officials in other states and from the U.S. Geological Survey.

After the rules have been drafted, he expects to hold a series of public hearings in Jackson and in some of the areas of surface mine activity, coming up with a final copy before the April 15, 1978 effective date.

Unregulated surface mining for sand, clay and gravel as well as some other minerals has been conduoted in Mississippi for generations, and there is little experience in state government agencies in administering the type of permit and review process spelled out in the reclamation bill.

Lawmakers this year settled on the Geological Survey as the primary administering agency as a compromise to avoid a deadlock over giving the job to the Soil and Water Conservation Commission or the Air and Water Pollution Control Commission.

"We were a compromise agency, but we know more about half the bill than anybody else," Moore said Tuesday, noting that his staff of 25, including 13 geologists, has been involved in locating and defining mineral deposits.

The state geologist said he expects that the agency will discover some "problems in the first reclamation law," but at this point he can't identify them with certainty.

The bill establishes two categories of materials for regulatory purposes, with stiffer permitting procedures spelled out for "class one" materials, including lignite coal, than for those in "class two", which includes sand and gravel.

Other materials in class one include bentonite clay, metallic ores, mineral clay, dolomite and phosphate.

"We wonder how some of the minerals got in class one and class two," Moore said, noting that mineral clay operations are limited and conducted on a smaller scale than some other types of surface mining.

"We may find that the review time on the reclamation plans is too much or too little," he added.

"But with the the one year lead time on implementation of the rules, those potential problems can be ironed out in the next legislative session.

And, some help may come in this area from the Soil and Water Conservation Commission which is trying to arrange a test run of the system.

"I anticipate that we will have to add some people to the staff," Moore said. But it's too early to tell how many new employes he will be needed to regulate the industry.

"It's possible we may have to hire people in some other fields," the geologist said, "But we may not because we're supposed to get help on the other end from the Soil and Water Conservation Commission," which contracts with the federal Soil Conservation Service.

Gale Martin, executive secretary of the Soil and Water Conservation commission, said his governing board probably will discuss at its next meeting how to conduct the inventory of exisiting surfaces mines before the Jan. 1 deadline, although the agency will be handicapped by a lack of additional money for the project.

"We're going to try to come up with something, but how we'll do it, I don't know," Martin said.

"It's going to take a good bit of getting out and riding in the counties to do this."

The commission has estimated that there are a million acres in abandoned surface mine pits and that there are about 34,000 acres involved in active and inactive sand and gravel operations.

The reclamation law excludes existing operations, until they expand, but the commission is responsible for locating the holes.

Some sand and gravel operators fought passage of the bill covering their industry, but Moore Tuesday said "If they do what they're supposed to do we don't foresee any problems" in regulating them.

And he added that the regulations drafted by the agency will take into consideration the various processes used to recover the materials.

Moore, who rates Mississippi's new reclamation bill "in the middle, better than a lot" of state surface mine laws, did not appear apprehensive Tuesday about taking on regulatory duties.

"We're going to do what that thing says. If that rubs somebody, then that's the way it's going to be."

The agency, he said, is "not going to discourage people from using our natural resources" where it is appropriate.

"We've got some people who are quite interested in Mississippi and the wise use of its resources, probably a lot more — than in the ordinary (state) agency."

APPENDIX 10

RESEARCH AND DEVELOPMENT CENTER

October 11, 1976

Mr. Frank Miller
Forestry Department
114 Dorman
Mississippi State, Mississippi 39762

Dear Frank:

Pursuant to our recent discussions regarding your demonstration project in Lowndes County illustrating the application of remotely sensed data to state and regional problems, I would like to make the following comments.

It is very refreshing to see a competent research team consisting of professionals and graduate students from forestry, landscape architecture, agronomy, and computer science take an interdisciplinary approach in demonstrating the use of remote sensing and computer technology in land use planning.

As you know the Mississippi Research and Development Center has been investigating innovative planning procedures and land and resource management techniques. As I understand it, your primary objective is to utilize satellite data, aircraft imagery, and ground truth to produce a potential land use plan for Lowndes County, Mississippi, in order to permit economic expansion of the area with a minimum of environmental disruption. The R & D Center's objectives are to demonstrate the use of computer technology in land and resource management in Lowndes County considering future applications in other primary growth areas or "areas of particular concern." The finished product should graphically and quantitatively illustrate which areas are suitable for various types of growth and what the potential impacts would be based on physical, social, and economic analyses. The analytical procedures employed will necessarily involve the use of attractiveness models and vulnerability on impact models.

It appears that the Environmental Studies Center and R & D Center objectives are complementary. We would like very much to work with you and your staff

Mr. Frank Miller
Page Two
October 11, 1976

on this project. We anticipate receiving $12,000 from the Appalachian Regional Commission for this endeavor. Although this is certainly a modest amount, we should be able to provide assistance in identifying and constructing appropriate models, collecting and formatting data, and evaluating alternative development plans.

If you wish to pursue this approach, we would be most happy to work with you toward collectively reaching the aforementioned objectives.

Sincerely,

Fred Wise

Fred Wise, Regional Planner
Community/Area Planning Division

FW:gs

cc Colbert Jones

RESEARCH AND DEVELOPMENT CENTER

February 11, 1977

Mr. Frank Miller
Forestry Department
114 Dorman
Mississippi State, Mississippi 39762

Dear Frank:

Pursuant to our recent discussions, I am returning a copy of your proposal with a few comments regarding assistance we would like to see you provide on the Tennessee-Tombigbee Waterway industrial sites study.

As you recall, the study is to be a detailed inventory of developable, industrial sites along the proposed Tennessee-Tombigbee Waterway in Mississippi. The potential industrial sites will be rated as to their "attractiveness" based on a full description and analysis of physical, social, economic and environmental characteristics of significance in industrial development.

We are to receive Appalachian Regional Commission (ARC) funds for this element of our continuing Tennessee-Tombigbee region planning program. In our proposal to ARC, we included most of the factors identified in your proposal. Because of our past study efforts in this area, we have much of the data necessary for the study; therefore, we will devote a great deal of time to the analysis of data in terms of industrial development suitability. However, data difficiencies do exist, i. e. updated land cover and land use patterns, local geology, and soils in terms of development constraints.

The study was recommended by Hammer Siller George Associates in their report on the potential economic impacts of the waterway and the Tennessee-Tombigbee Land and Transportation Resources Study Committee. The study should prove to be of assistance to decision makers in northeast Mississippi regarding industrial land acquisition and development. However, the decision makers in the region realize it is time to take action in securing prime industrial sites along the waterway with or without the industrial sites study. Therefore, it will be necessary to complete the study as soon as possible to maximize its benefits.

Your assistance in physical data acquisition, regarding the previously mentioned data difficiencies, would be very beneficial.

Sincerely,

James F. Wise

James F. Wise
Regional Planner

JFW:js
Enclosure

cc: Dr. Gary Higgs

P.O. DRAWER 2470 · JACKSON, MISSISSIPPI 39205 (3825 RIDGEWOOD ROAD) · PHONE 601-982-6606

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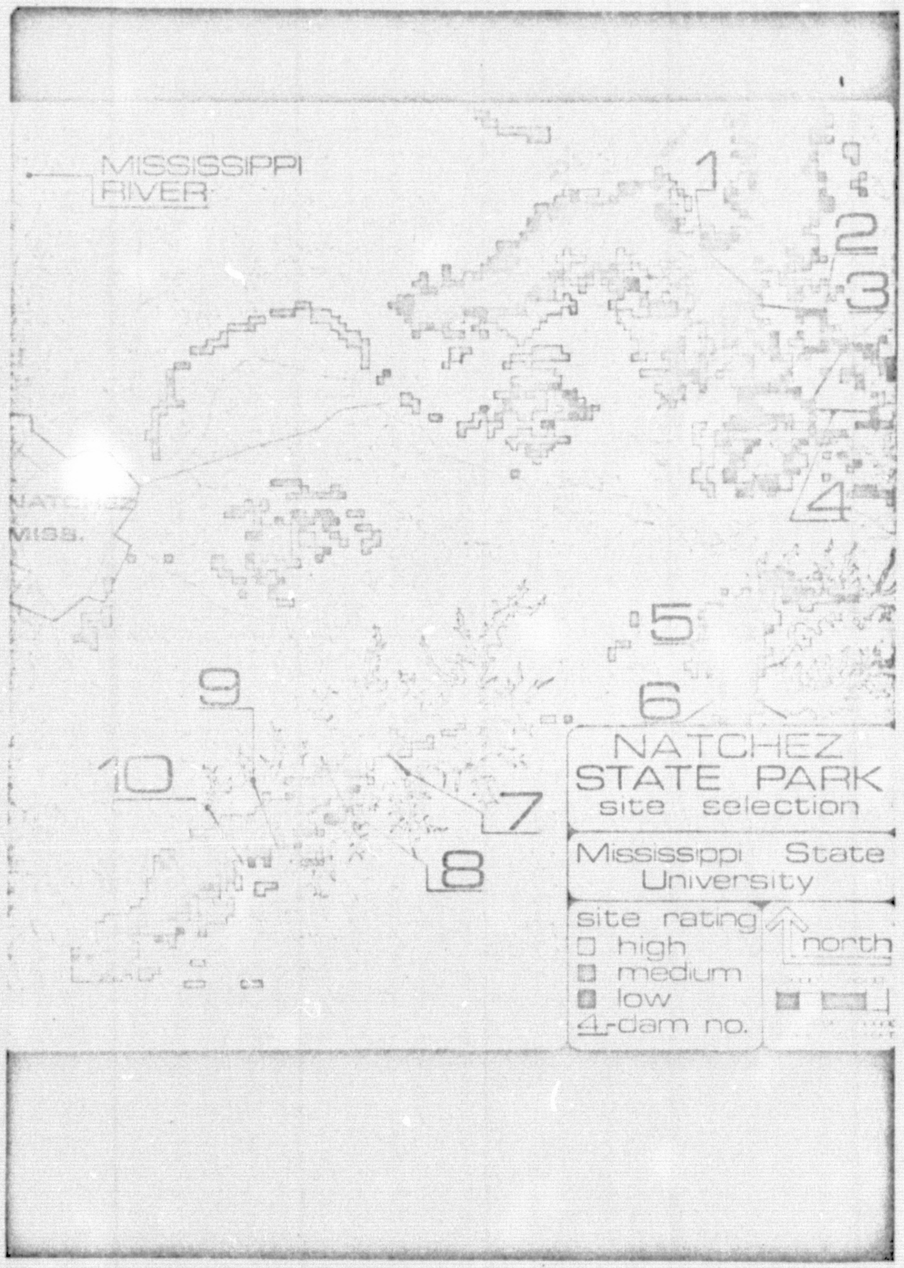

Figure 1. Location and rating of potential park sites, Adams Co., Miss.

Figure 2. Site selected by the Mississippi Park Commission for more intensive study.

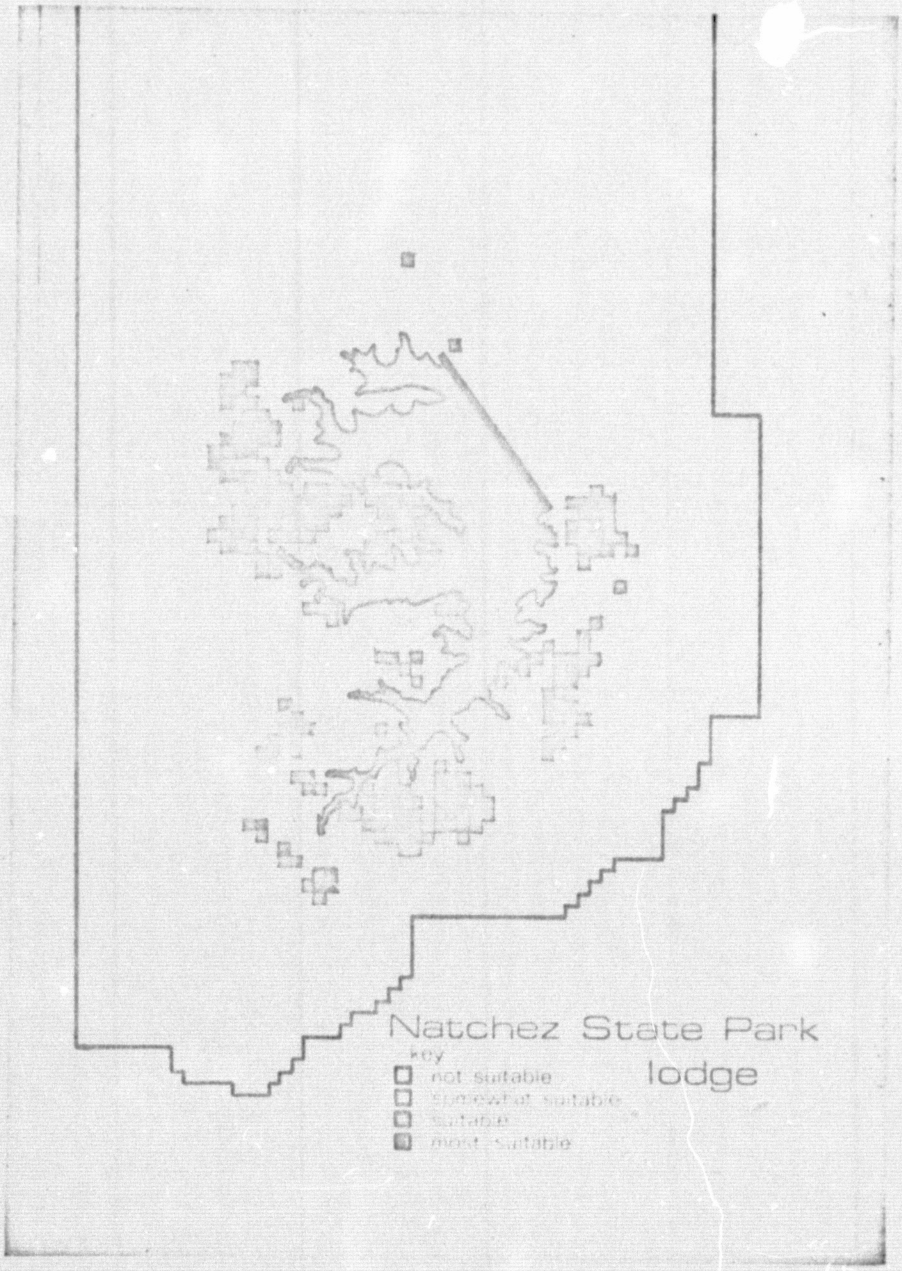

Figure 3. Suitability rating of cells for location of a lodge building.

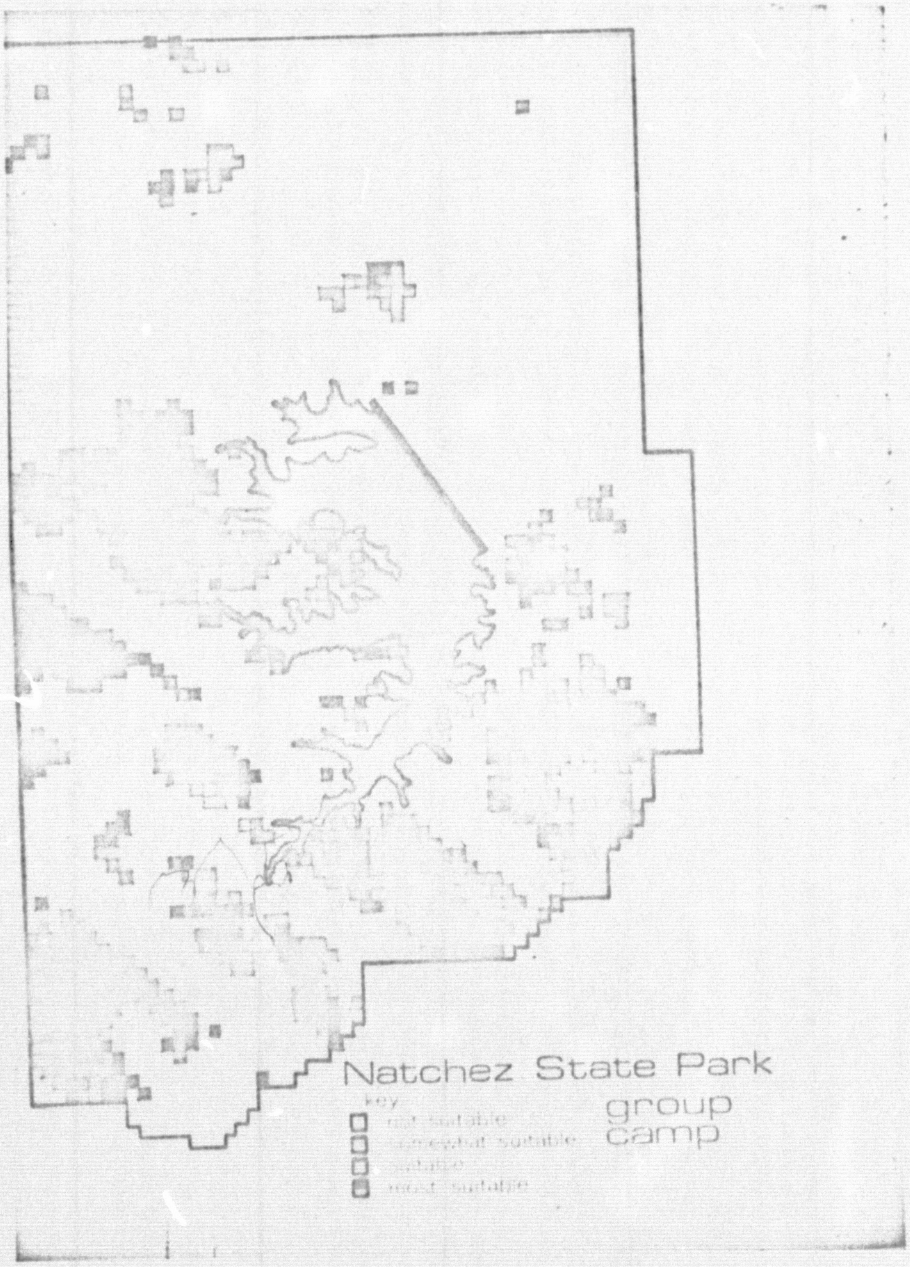

Figure 4. Suitability rating of cells for group camp location.

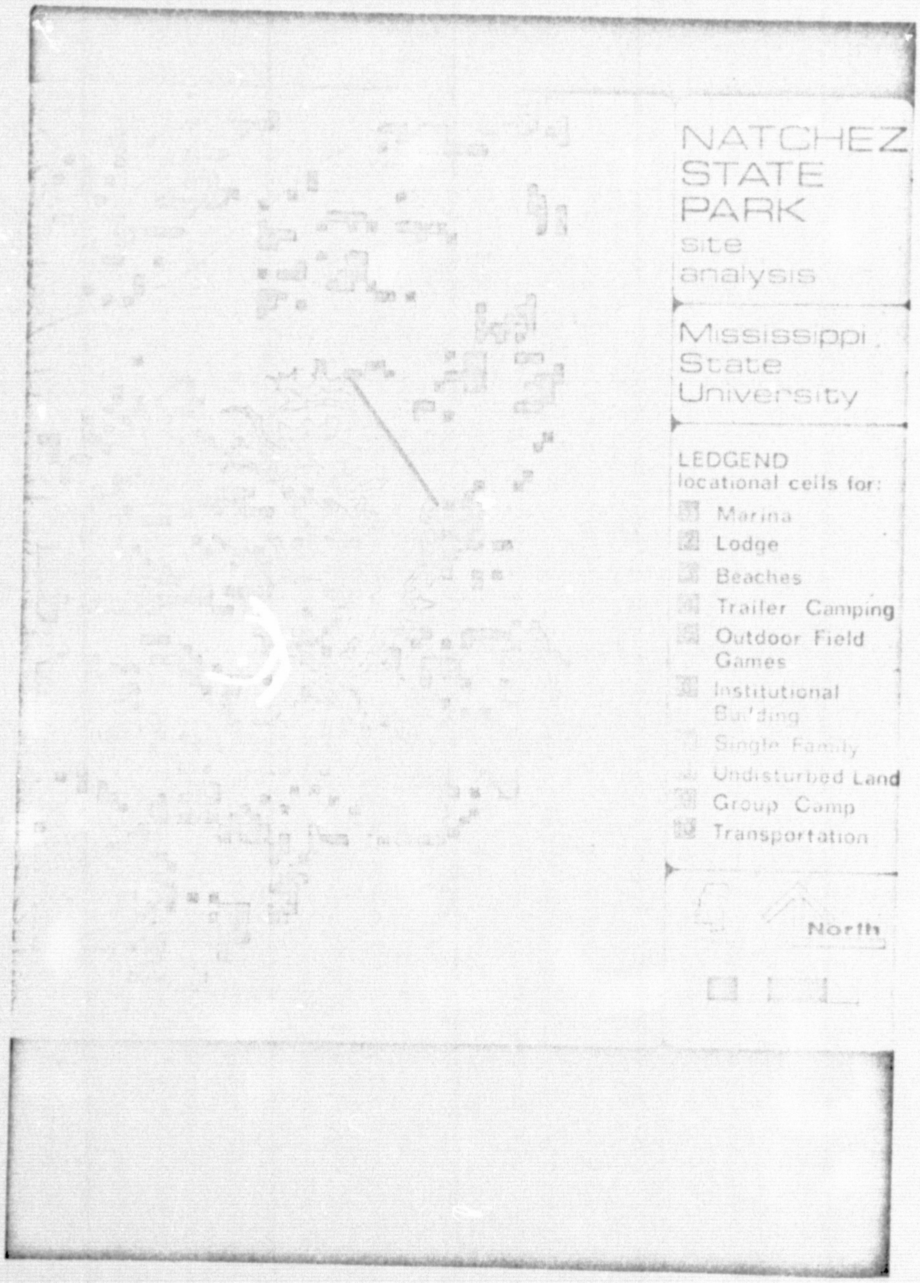

Figure 5. Example of master planning through the use of the CALUP program.